# TEST REPORT

**FCC ID: 2ADYY-AE10**

**Product: Mobile Phone**

**Model No.: AE10**

**Trade Mark: TECNO**

**Report No.: WSCT-A2LA-R&E240300009A-LE**

**Issued Date: 11 July 2024**

Issued for:

**TECNO MOBILE LIMITED**
**FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG**

Issued By:

**World Standardization Certification & Testing Group(Shenzhen) Co.,Ltd.**
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# 1. Test Certification

| | |
|---|---|
| **Product:** | Mobile Phone |
| **Model No.:** | AE10 |
| **Trade Mark:** | TECNO |
| **Applicant:** | **TECNO MOBILE LIMITED**<br>FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG |
| **Manufacturer:** | **TECNO MOBILE LIMITED**<br>FLAT N 16/F BLOCK B UNIVERSAL INDUSTRIAL CENTRE 19-25 SHAN MEI STREET FOTAN NT HONGKONG |
| **Date of receipt:** | 14 February 2024 |
| **Date of Test:** | 15 February 2024 to 11 July 2024 |
| **Applicable Standards:** | FCC CFR Title 47 Part 15 Subpart C Section 15.247<br>KDB 558074 D01 DTS Meas Guidance v04 |

*The above equipment has been tested by World Standardization Certification & Testing Group(Shenzhen)Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.*

***Tested By:*** _____ ***Checked By:*** _____

***(Wang Xiang)*** ***( Qin Shuiquan)***

***Approved By:*** _____ ***Date:*** _____

***( Liu Fuxin)***

## 2. Test Result Summary

| Requirement | CFR 47 Section | Result |
|---|---|---|
| Antenna requirement | §15.203/§15.247 (c) | PASS |
| AC Power Line Conducted Emission | §15.207 | PASS |
| Maximum conducted output power | §15.247 (b)(3)<br>§2.1046 | PASS |
| 6dB Emission Bandwidth | §15.247 (a)(2)<br>§2.1049 | PASS |
| Power Spectral Density | §15.247 (e) | PASS |
| Band Edge | 1§5.247(d)<br>§2.1051, §2.1057 | PASS |
| Spurious Emission | §15.205/§15.209<br>§2.1053, §2.1057 | PASS |

***Note:***

*1. PASS: Test item meets the requirement.*

*2. Fail: Test item does not meet the requirement.*

*3. N/A: Test case does not apply to the test object.*

*4. The test result judgment is decided by the limit of test standard.*

# 3. EUT Description

| | |
|---|---|
| **Product Name:** | Mobile Phone |
| **Model :** | AE10 |
| **Trade Mark:** | TECNO |
| **Software version:** | AE10-H833A-U-OP-240421V2267 |
| **Hardware version:** | V1.2 |
| **Operation Frequency:** | 2402MHz~2480MHz |
| **Channel Separation:** | 2MHz |
| **Number of Channel:** | 40 |
| **Modulation Technology:** | GFSK |
| **Antenna Type:** | FIPA Antenna |
| **Antenna Gain:** | -4.01dBi |
| **Operating Voltage:** | Adapter: U700TSA<br>Input: 100-240V~50/60Hz 2.0A<br>Output: 5.0V⎓3.0A 15.0W<br>or 5.0-10.0V⎓7.0A MAX<br>or 11.0V⎓6.4A MAX<br>or 4.0-20.0V⎓3.5A 70.0W MAX<br>Rechargeable Li-ion Polymer Battery Model1: BL-29GT<br>Rated Voltage: 3.86V<br>Rated Capacity: 2973mAh/11.48Wh<br>Typical Capacity: 3043mAh/11.75Wh<br>Limited Charge Voltage: 4.53V<br>Rechargeable Li-ion Polymer Battery Model2: BL-25MT<br>Rated Voltage: 3.86V<br>Rated Capacity: 2637mAh/10.18Wh<br>Typical Capacity: 2707mAh/10.45Wh<br>Limited Charge Voltage: 4.53V |
| **Remark:** | N/A. |

Note: 1. N/A stands for no applicable.
2. Antenna gain provided by the customer.

**Operation Frequency each of channel**

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|---|---|
| 0 | 2402MHz | 10 | 2422MHz | 20 | 2442MHz | 30 | 2462MHz |
| 1 | 2404MHz | 11 | 2424MHz | 21 | 2444MHz | 31 | 2464MHz |
| … | … | … | … | … | … | … | … |
| 8 | 2418MHz | 18 | 2438MHz | 28 | 2458MHz | 38 | 2478MHz |
| 9 | 2420MHz | 19 | 2440MHz | 29 | 2460MHz | 39 | 2480MHz |
| Remark: Channel 0, 19 & 39 have been tested. | | | | | | | |

# 4. Genera Information

## 4.1. Test environment and mode

| | |
|---|---|
| **Operating Environment:** | |
| Temperature: | 25.0 °C |
| Humidity: | 56 % RH |
| Atmospheric Pressure: | 1010 mbar |
| **Test Mode:** | |
| Engineering mode: | Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%) with Fully-charged battery. |
| The sample was placed (0.1m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. | |

## 4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Equipment | Model No. | Serial No. | FCC ID | Trade Name |
|---|---|---|---|---|
| / | / | / | / | / |

***Note:***

*1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*

*2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

*3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.*

# 5. Facilities and Accreditations

## 5.1. Facilities

All measurement facilities used to collect the measurement data are located at **Building A-B, Baoshi Science & Technology Park, Baoshi Road, Bao'an District, Shenzhen, Guangdong, China of the World Standardization Certification & Testing Group(Shenzhen) CO., LTD**

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 5.2. ACCREDITATIONS

**CNAS - Registration Number: L3732**

China National Accreditation Service for Conformity Assessment, The test firm Registration Number: L3732

**FCC - Designation Number: CN1303**

World Standardization Certification & Testing Group(Shenzhen) CO., LTD. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Designation Number: CN1303.

**A2LA - Certificate Number: 5768.01**

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA).Certification Number: 5768.01

## 5.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

| No. | Item | MU |
|---|---|---|
| 1 | Power Spectral Density | ±3.2dB |
| 2 | Duty Cycle and Tx-Sequence and Tx-Gap | ±1% |
| 3 | Medium Utilisation Factor | ±1.3% |
| 4 | Occupied Channel Bandwidth | ±2.4% |
| 5 | Transmitter Unwanted Emission in the out-of Band | ±1.3% |
| 6 | Transmitter Unwanted Emissions in the Spurious Domain | ±2.5% |
| 7 | Receiver Spurious Emissions | ±2.5% |
| 8 | Conducted Emission Test | ±3.2dB |
| 9 | RF power, conducted | ±0.16dB |
| 10 | Spurious emissions, conducted | ±0.21dB |
| 11 | All emissions, radiated(<1GHz) | ±4.7dB |
| 12 | All emissions, radiated(>1GHz) | ±4.7dB |
| 13 | Temperature | ±0.5°C |
| 14 | Humidity | ±2.0% |

## 5.4. MEASUREMENT INSTRUMENTS

| NAME OF EQUIPMENT | MANUFACTURER | MODEL | SERIAL NUMBER | Calibration Date | Calibration Due. |
|---|---|---|---|---|---|
| Test software | -- | EZ-EMC | CON-03A | - | - |
| Test software | -- | MTS8310 | - | - | - |
| EMI Test Receiver | R&S | ESCI | 100005 | 11/05/2023 | 11/04/2024 |
| LISN | AFJ | LS16 | 16010222119 | 11/05/2023 | 11/04/2024 |
| LISN(EUT) | Mestec | AN3016 | 04/10040 | 11/05/2023 | 11/04/2024 |
| Universal Radio Communication Tester | R&S | CMU 200 | 1100.0008.02 | 11/05/2023 | 11/04/2024 |
| Coaxial cable | Megalon | LMR400 | N/A | 11/05/2023 | 11/04/2024 |
| GPIB cable | Megalon | GPIB | N/A | 11/05/2023 | 11/04/2024 |
| Spectrum Analyzer | R&S | FSU | 100114 | 11/05/2023 | 11/04/2024 |
| Pre Amplifier | H.P. | HP8447E | 2945A02715 | 11/05/2023 | 11/04/2024 |
| Pre-Amplifier | CDSI | PAP-1G18-38 | -- | 11/05/2023 | 11/04/2024 |
| Bi-log Antenna | SCHWARZBECK | VULB9168 | 01488 | 7/29/2023 | 7/28/2024 |
| 9*6*6 Anechoic | -- | -- | -- | 11/05/2023 | 11/04/2024 |
| Horn Antenna | COMPLIANCE ENGINEERING | CE18000 | -- | 11/05/2023 | 11/04/2024 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 9120D-631 | 11/05/2023 | 11/04/2024 |
| Cable | TIME MICROWAVE | LMR-400 | N-TYPE04 | 11/05/2023 | 11/04/2024 |
| System-Controller | CCS | N/A | N/A | N.C.R | N.C.R |
| Turn Table | CCS | N/A | N/A | N.C.R | N.C.R |
| Antenna Tower | CCS | N/A | N/A | N.C.R | N.C.R |
| RF cable | Murata | MXHQ87WA3000 | - | 11/05/2023 | 11/04/2024 |
| Loop Antenna | EMCO | 6502 | 00042960 | 11/05/2023 | 11/04/2024 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 1123 | 11/05/2023 | 11/04/2024 |
| Power meter | Anritsu | ML2487A | 6K00003613 | 11/05/2023 | 11/04/2024 |
| Power sensor | Anritsu | MX248XD | -- | 11/05/2023 | 11/04/2024 |
| Spectrum Analyzer | Keysight | N9010B | MY60241089 | 11/05/2023 | 11/04/2024 |

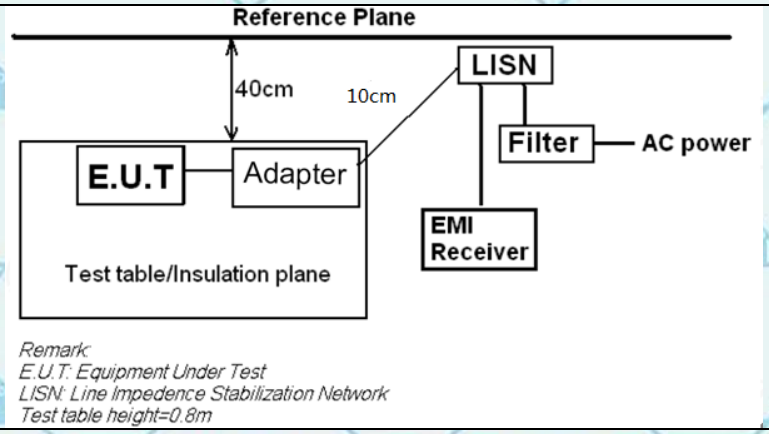
# 6. Test Results and Measurement Data

## 6.1. Antenna requirement

| **Standard requirement:** | FCC Part15 C Section 15.203 /247(c) |
|---|---|
| 15.203 requirement:<br>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.<br>15.247(c) (1)(i) requirement:<br>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi. | |
| **E.U.T Antenna:** | |
| The Bluetooth antenna is a FIPA Antenna. it meets the standards, and the best case gain of the antenna is -4.01dBi. | |

## 6.2. Conducted Emission

### 6.2.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.207 |
| **Test Method:** | ANSI C63.10:2014 |
| **Frequency Range:** | 150 kHz to 30 MHz |
| **Receiver setup:** | RBW=9 kHz, VBW=30 kHz, Sweep time=auto |
| **Limits:** | Frequency range (MHz) / Limit (dBuV): Quasi-peak / Average<br>0.15-0.5: 66 to 56* / 56 to 46*<br>0.5-5: 56 / 46<br>5-30: 60 / 50 |
| **Test Setup:** |  <br>*Remark:*<br>*E.U.T: Equipment Under Test*<br>*LISN: Line Impedence Stabilization Network*<br>*Test table height=0.8m* |
| **Test Mode:** | Charging + Transmitting Mode |
| **Test Procedure:** | 1. The E.U.T is connected to an adapter through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.<br>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).<br>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2014 on conducted measurement. |
| **Test Result:** | N/A |

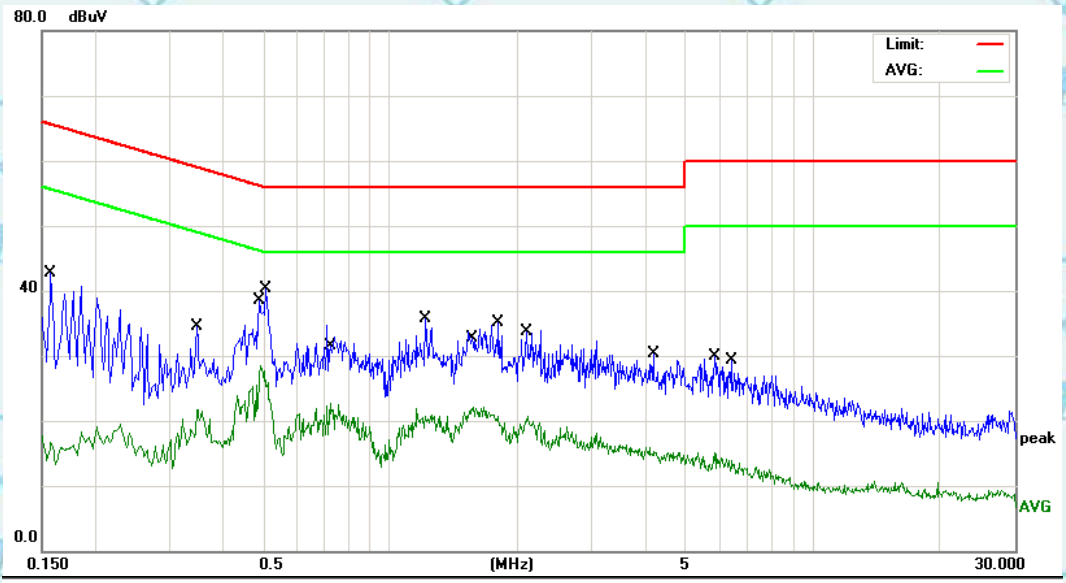
### 6.2.2. EUT OPERATING CONDITIONS

The EUT is working in the Normal link mode. All modes have been tested and normal link mode is worst.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 60 Hz and 240 VAC, 50 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

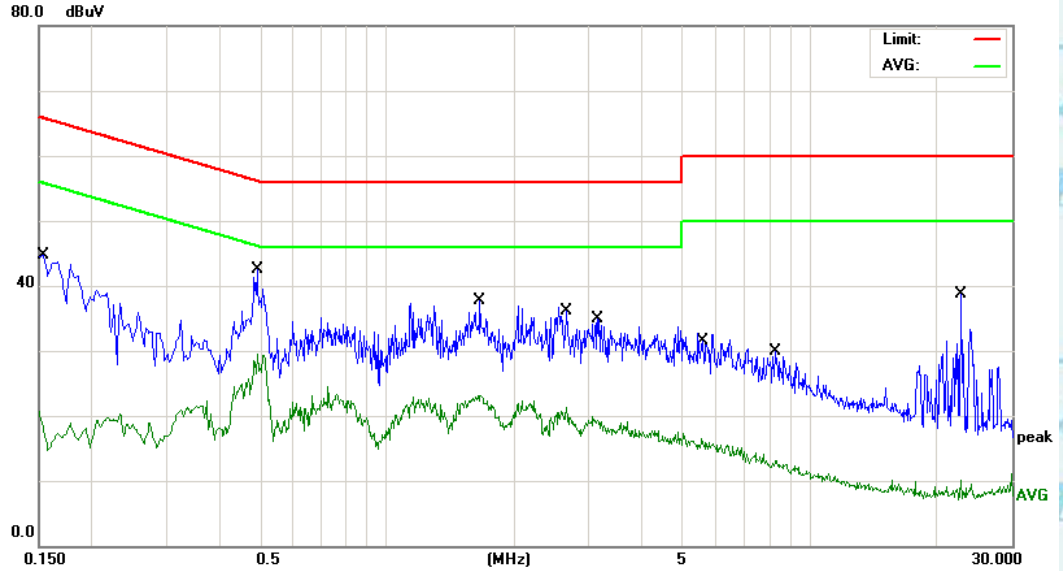
**Test data**

## Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.1580 | 32.31 | 10.45 | 42.76 | 65.56 | -22.80 | QP |
| 2 | | 0.3500 | 11.28 | 10.48 | 21.76 | 48.96 | -27.20 | AVG |
| 3 | | 0.4940 | 17.92 | 10.52 | 28.44 | 46.10 | -17.66 | AVG |
| 4 | * | 0.5100 | 29.77 | 10.52 | 40.29 | 56.00 | -15.71 | QP |
| 5 | | 0.7220 | 12.27 | 10.53 | 22.80 | 46.00 | -23.20 | AVG |
| 6 | | 1.2140 | 25.03 | 10.58 | 35.61 | 56.00 | -20.39 | QP |
| 7 | | 1.5740 | 11.53 | 10.64 | 22.17 | 46.00 | -23.83 | AVG |
| 8 | | 1.8020 | 24.48 | 10.68 | 35.16 | 56.00 | -20.84 | QP |
| 9 | | 2.1140 | 9.94 | 10.71 | 20.65 | 46.00 | -25.35 | AVG |
| 10 | | 4.1979 | 19.58 | 10.73 | 30.31 | 56.00 | -25.69 | QP |
| 11 | | 5.8500 | 4.40 | 10.76 | 15.16 | 50.00 | -34.84 | AVG |
| 12 | | 6.4180 | 18.45 | 10.77 | 29.22 | 60.00 | -30.78 | QP |

## Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.1500 | 10.27 | 10.45 | 20.72 | 55.99 | -35.27 | AVG |
| 2 | | 0.1539 | 34.26 | 10.45 | 44.71 | 65.78 | -21.07 | QP |
| 3 | * | 0.4940 | 31.93 | 10.52 | 42.45 | 56.10 | -13.65 | QP |
| 4 | | 0.4940 | 19.06 | 10.52 | 29.58 | 46.10 | -16.52 | AVG |
| 5 | | 1.6420 | 12.42 | 10.65 | 23.07 | 46.00 | -22.93 | AVG |
| 6 | | 1.6620 | 27.01 | 10.66 | 37.67 | 56.00 | -18.33 | QP |
| 7 | | 2.6540 | 10.49 | 10.72 | 21.21 | 46.00 | -24.79 | AVG |
| 8 | | 3.1460 | 24.16 | 10.72 | 34.88 | 56.00 | -21.12 | QP |
| 9 | | 5.5380 | 5.77 | 10.75 | 16.52 | 50.00 | -33.48 | AVG |
| 10 | | 8.2500 | 19.16 | 10.80 | 29.96 | 60.00 | -30.04 | QP |
| 11 | | 22.7139 | 27.57 | 11.09 | 38.66 | 60.00 | -21.34 | QP |
| 12 | | 22.7139 | -1.07 | 11.09 | 10.02 | 50.00 | -39.98 | AVG |

***Note1:***

*Freq. = Emission frequency in MHz*

*Reading level (dBμV) = Receiver reading*

*Corr. Factor (dB) = LISN Factor + Cable loss*

*Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)*

*Limit (dBμV) = Limit stated in standard*

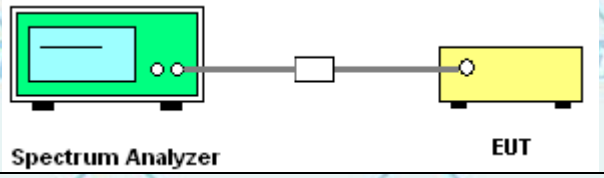
*Margin (dB) = Measurement (dBμV) – Limits (dBμV)*

*Q.P. =Quasi-Peak AVG =average*

** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

## 6.3. Conducted Output Power

### 6.3.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.247 (b)(3) |
| **Test Method:** | KDB558074 |
| **Limit:** | 30dBm |
| **Test Setup:** |  |
| **Test Mode:** | Refer to item 4.1 |
| **Test Procedure:** | 1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04.<br>2. Set spectrum analyzer as following:<br>a) Set the RBW ≥ DTS bandwidth.<br>b) Set VBW ≥ 3 × RBW.<br>c) Set span ≥ 3 x RBW<br>d) Sweep time = auto couple.<br>e) Detector = peak.<br>f) Trace mode = max hold.<br>g) Allow trace to fully stabilize.<br>h) Use peak marker function to determine the peak amplitude level. |
| **Test Result:** | PASS |

### 6.3.2. Test Data

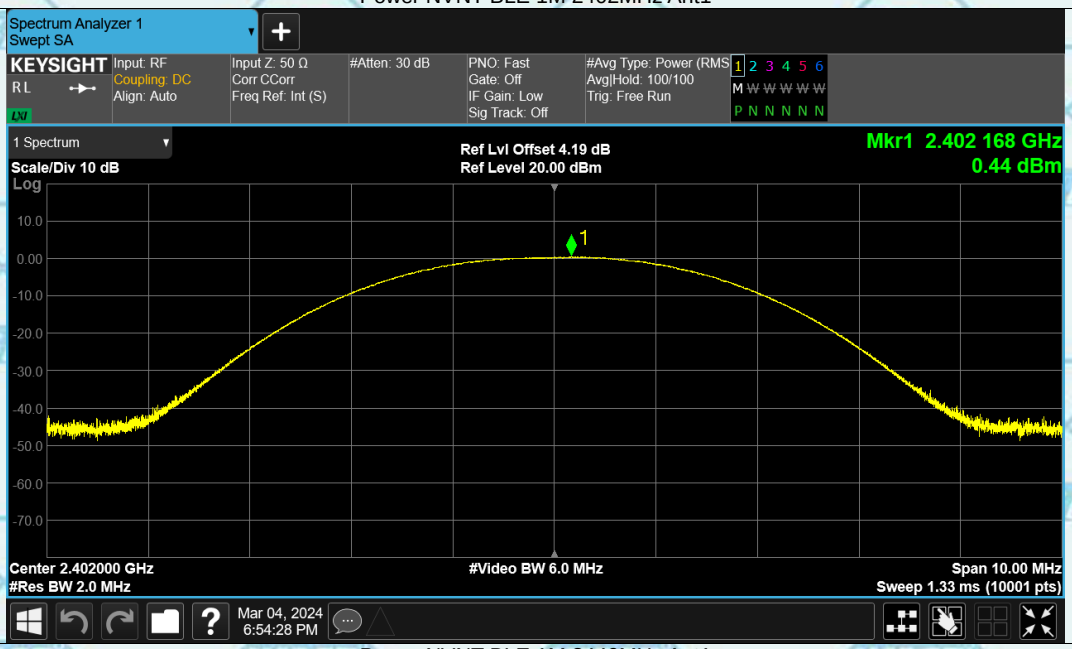
| BLE 1M | | | |
|---|---|---|---|
| Test channel | Maximum conducted output power (dBm) | Limit (dBm) | Result |
| Lowest | 0.44 | 30.00 | PASS |
| Middle | 0.79 | 30.00 | PASS |
| Highest | 0.18 | 30.00 | PASS |

| BLE 2M | | | |
|---|---|---|---|
| Test channel | Maximum Conducted Output Power (dBm) | Limit (dBm) | Result |
| Lowest | 0.74 | 30.00 | PASS |
| Middle | 0.72 | 30.00 | PASS |
| Highest | 0.09 | 30.00 | PASS |

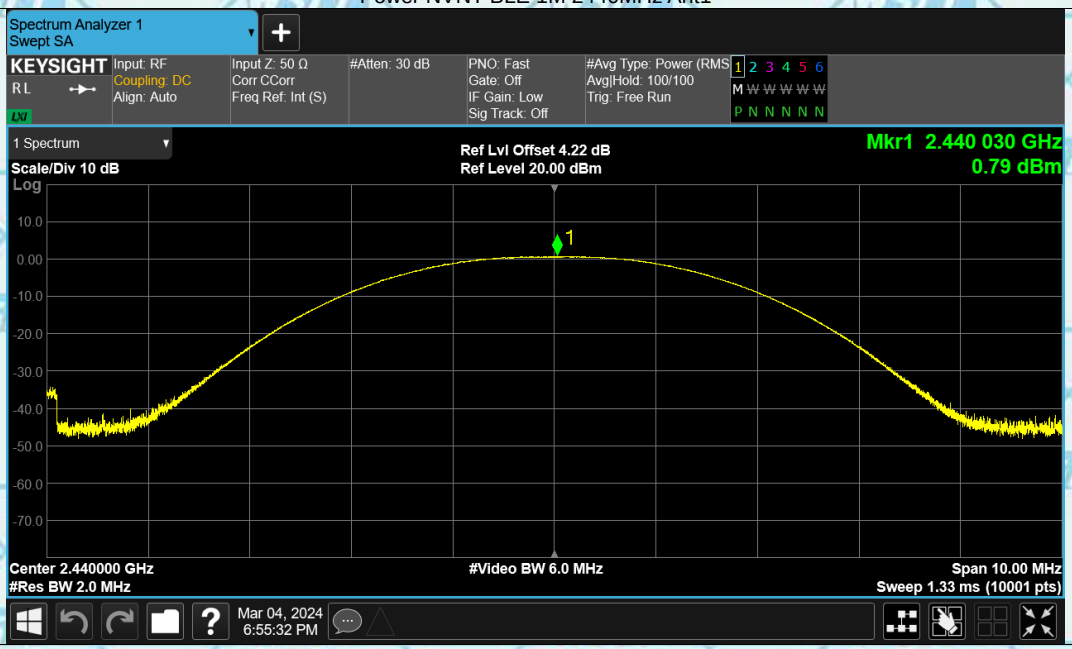
**Test plots as follows:**

Test Graphs

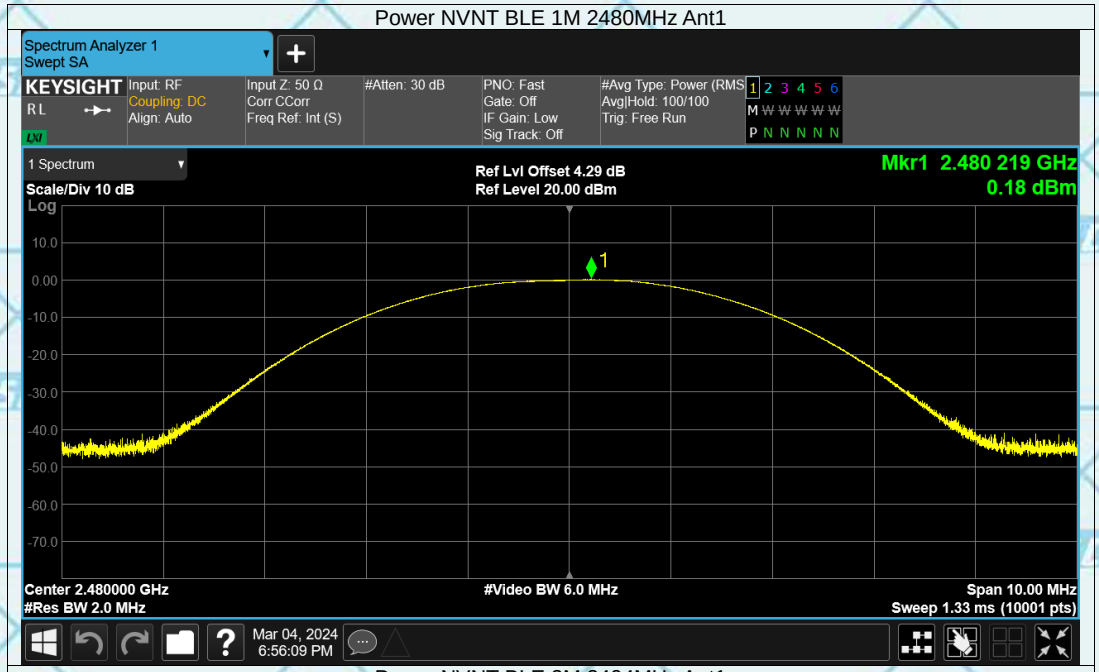
Power NVNT BLE 1M 2402MHz Ant1



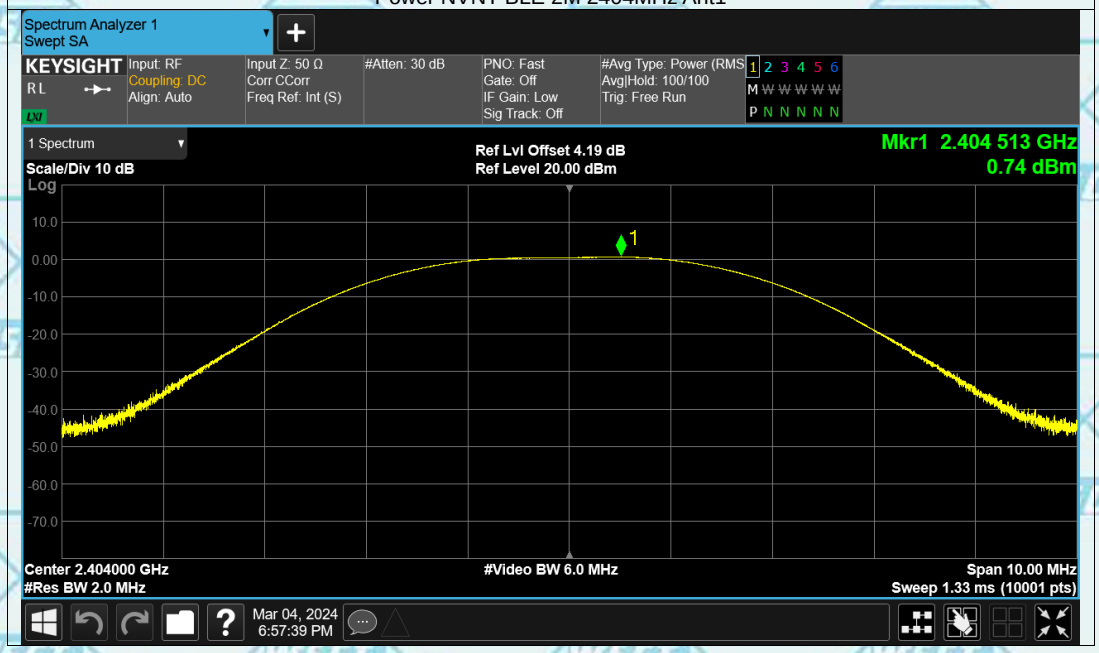

Power NVNT BLE 1M 2440MHz Ant1



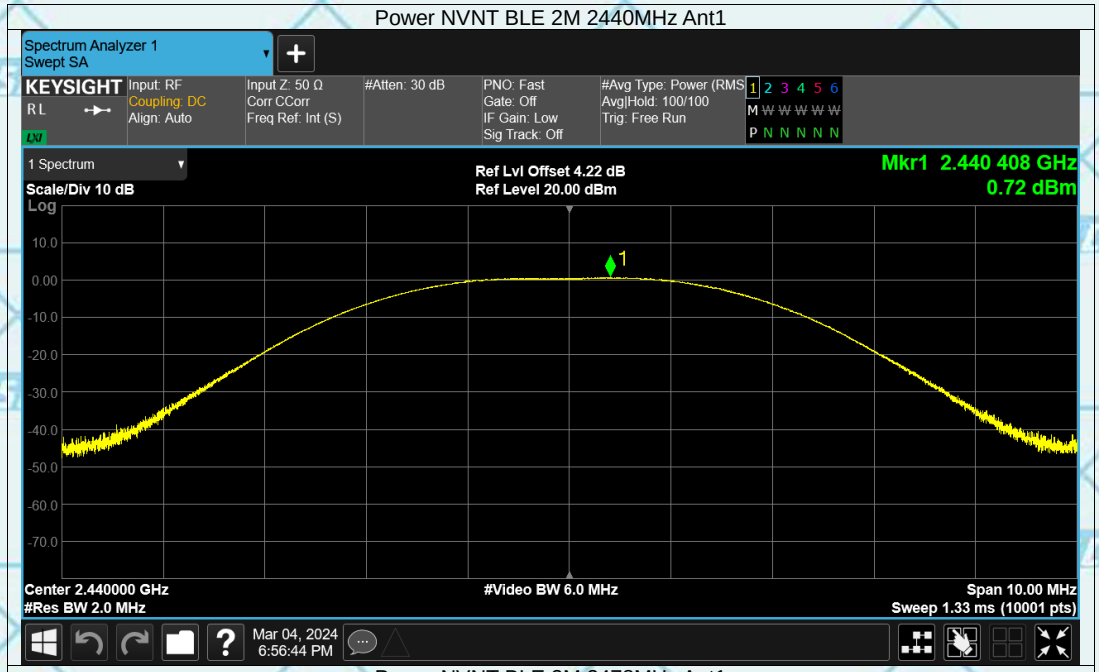
Power NVNT BLE 1M 2480MHz Ant1



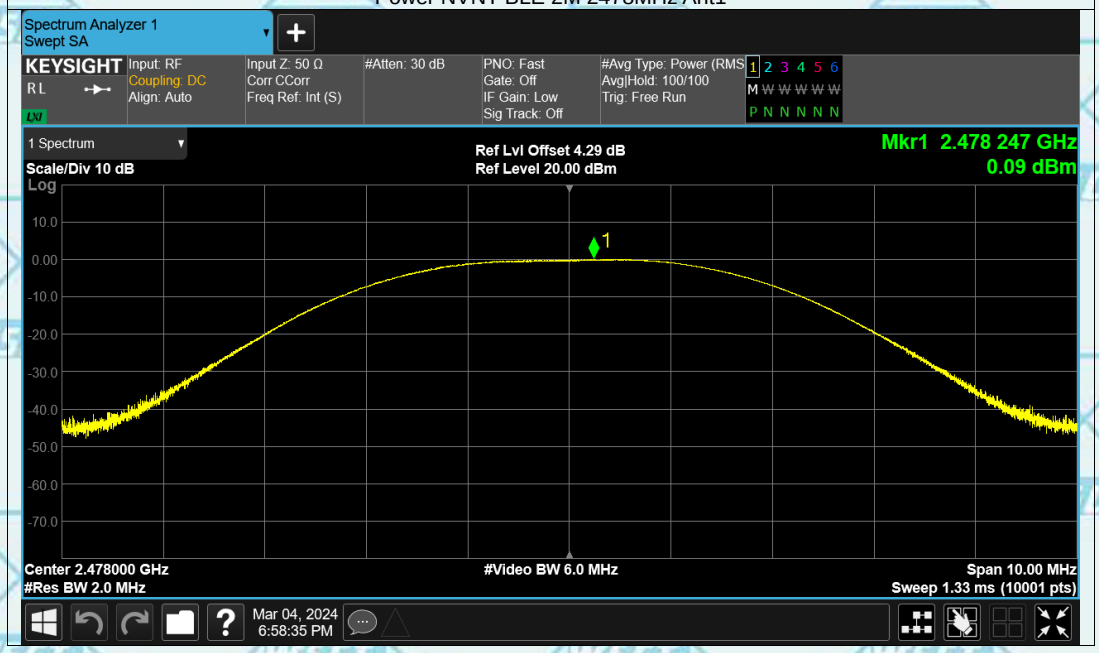

Power NVNT BLE 2M 2404MHz Ant1



Power NVNT BLE 2M 2440MHz Ant1

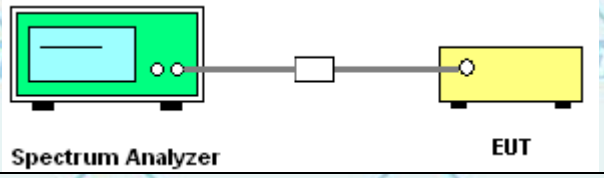



Power NVNT BLE 2M 2478MHz Ant1



## 6.4. Emission Bandwidth

### 6.4.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.247 (a)(2) |
| **Test Method:** | KDB558074 |
| **Limit:** | >500kHz |
| **Test Setup:** |  |
| **Test Mode:** | Refer to item 4.1 |
| **Test Procedure:** | 1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04.<br>2. Set to the maximum power setting and enable the EUT transmit continuously.<br>3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.<br>4. Measure and record the results in the test report. |
| **Test Result:** | PASS |

### 6.4.2. Test data

**BLE 1M**

| Test channel | 6dB Emission Bandwidth (kHz) | | |
|---|---|---|---|
| | BT LE mode | Limit | Result |
| Lowest | 0.7238 | >500k | PASS |
| Middle | 0.6901 | >500k | |
| Highest | 0.6518 | >500k | |

**BLE 2M**

| Test channel | 6dB Emission Bandwidth (kHz) | | |
|---|---|---|---|
| | BT LE mode | Limit | Result |
| Lowest | 1.258 | >500k | PASS |
| Middle | 1.226 | >500k | |
| Highest | 1.238 | >500k | |

**Test plots as follows:**

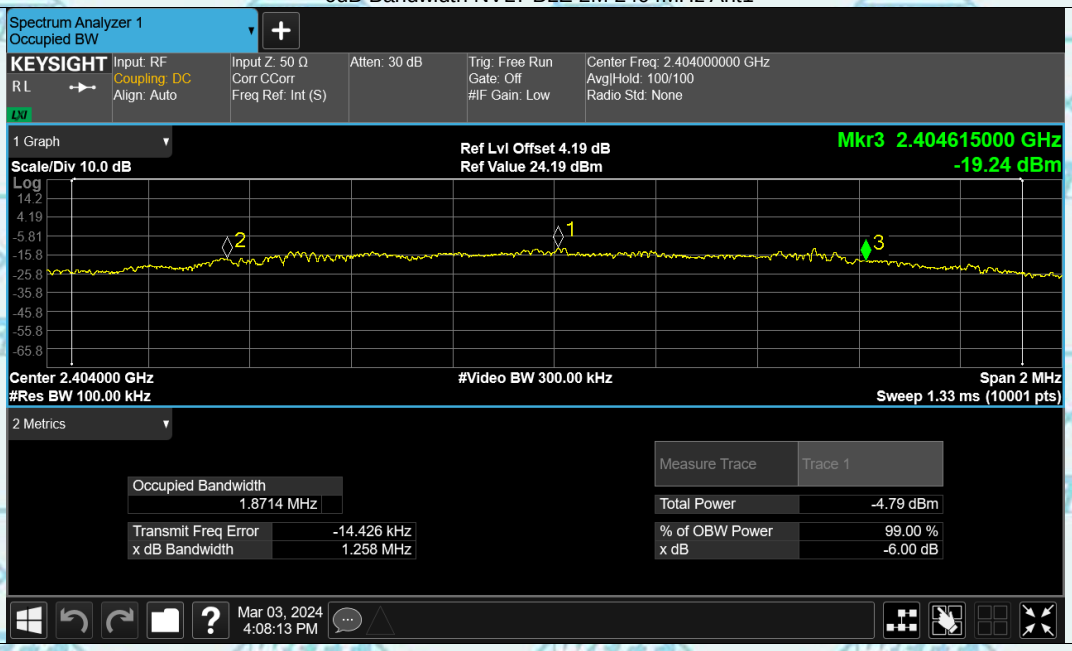
Test Graphs

-6dB Bandwidth NVLT BLE 1M 2402MHz Ant1

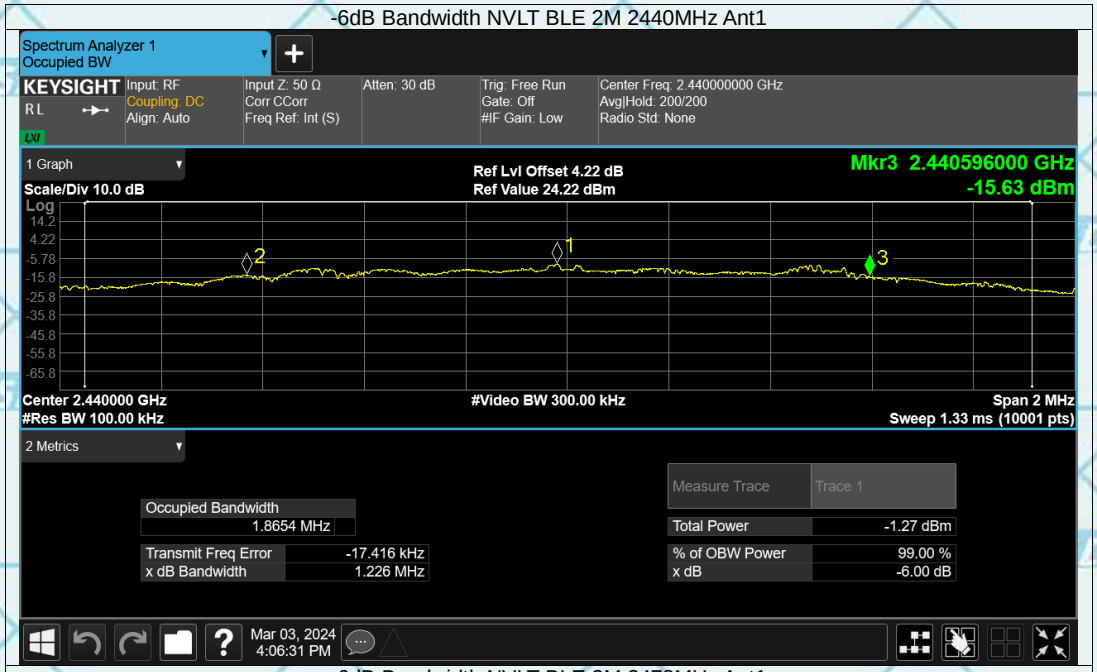

-6dB Bandwidth NVLT BLE 1M 2440MHz Ant1

-6dB Bandwidth NVLT BLE 1M 2480MHz Ant1


-6dB Bandwidth NVLT BLE 2M 2404MHz Ant1



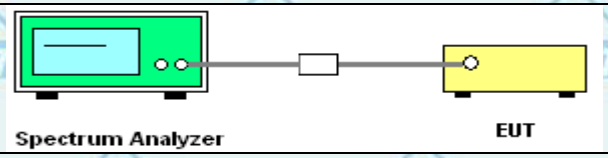
-6dB Bandwidth NVLT BLE 2M 2440MHz Ant1




-6dB Bandwidth NVLT BLE 2M 2478MHz Ant1

## 6.5. Power Spectral Density

### 6.5.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.247 (e) |
| **Test Method:** | KDB558074 |
| **Limit:** | The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission. |
| **Test Setup:** |  |
| **Test Mode:** | Refer to item 4.1 |
| **Test Procedure:** | 1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v04<br>2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.<br>3. Set to the maximum power setting and enable the EUT transmit continuously.<br>4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)<br>5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.<br>6. Measure and record the results in the test report. |
| **Test Result:** | PASS |

### 6.5.2. Test Instruments

| RF Test Room | | | | |
|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | R&S | FSU | 200054 | Sep. 27, 2018 |
| RF cable (9kHz-26.5GHz) | TCT | RE-06 | N/A | Sep. 27, 2018 |
| Antenna Connector | TCT | RFC-01 | N/A | Sep. 27, 2018 |

***Note:*** *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

### 6.5.3. Test data

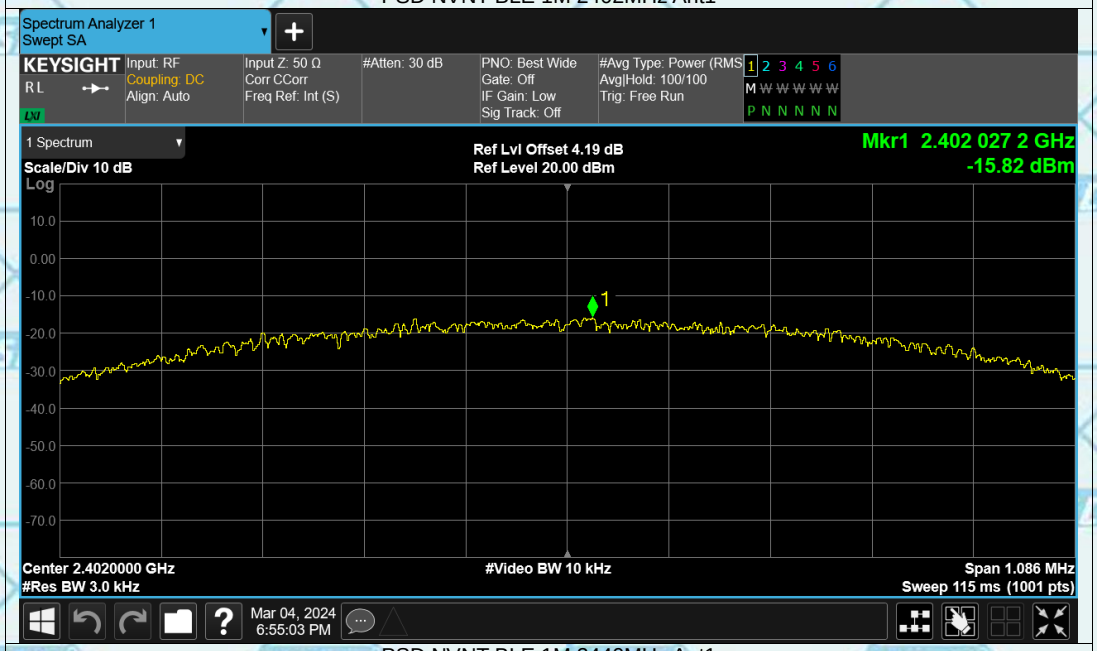
| Test channel | Power Spectral Density (dBm/3kHz) | | |
|---|---|---|---|
| | BLE 1M | Limit | Result |
| Lowest | -15.82 | 8 dBm/3kHz | PASS |
| Middle | -15.73 | 8 dBm/3kHz | |
| Highest | -16.16 | 8 dBm/3kHz | |

| Test channel | Power Spectral Density (dBm/3kHz) | | |
|---|---|---|---|
| | BLE 2M | Limit | Result |
| Lowest | -17.97 | 8 dBm/3kHz | PASS |
| Middle | -18.07 | 8 dBm/3kHz | |
| Highest | -18.77 | 8 dBm/3kHz | |

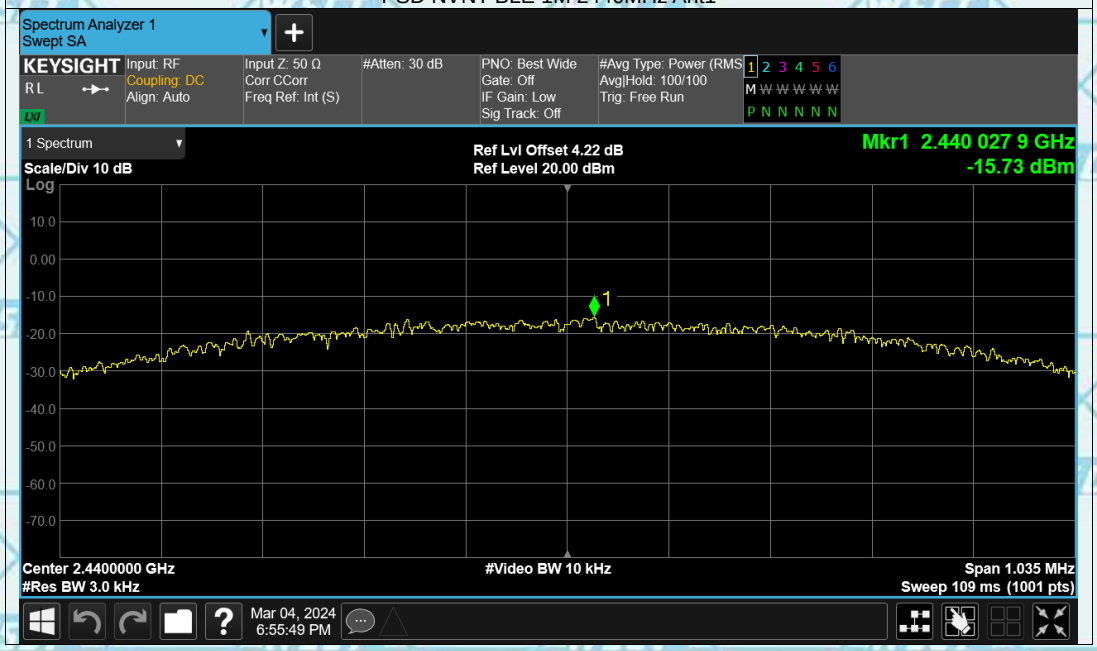
**Test plots as follows:**

Test Graphs

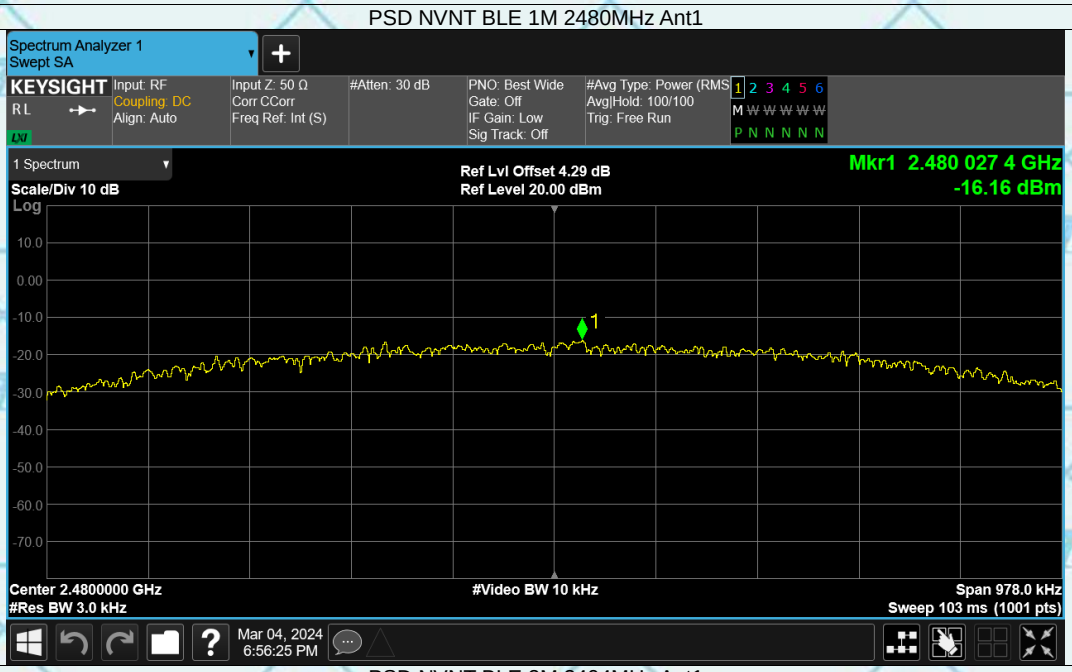
PSD NVNT BLE 1M 2402MHz Ant1



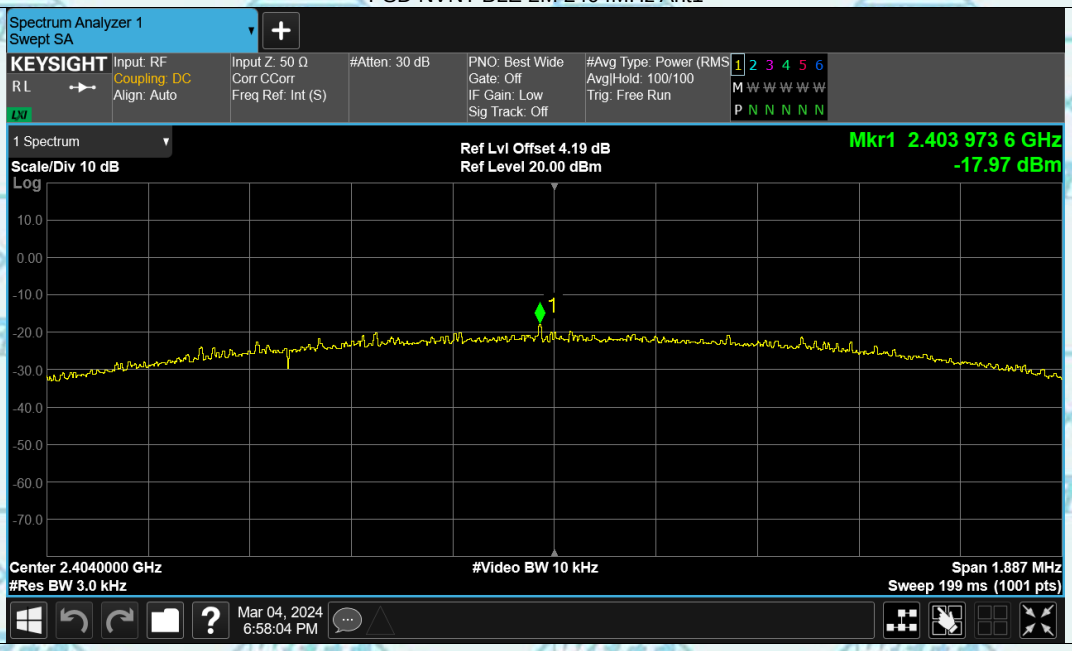

PSD NVNT BLE 1M 2440MHz Ant1



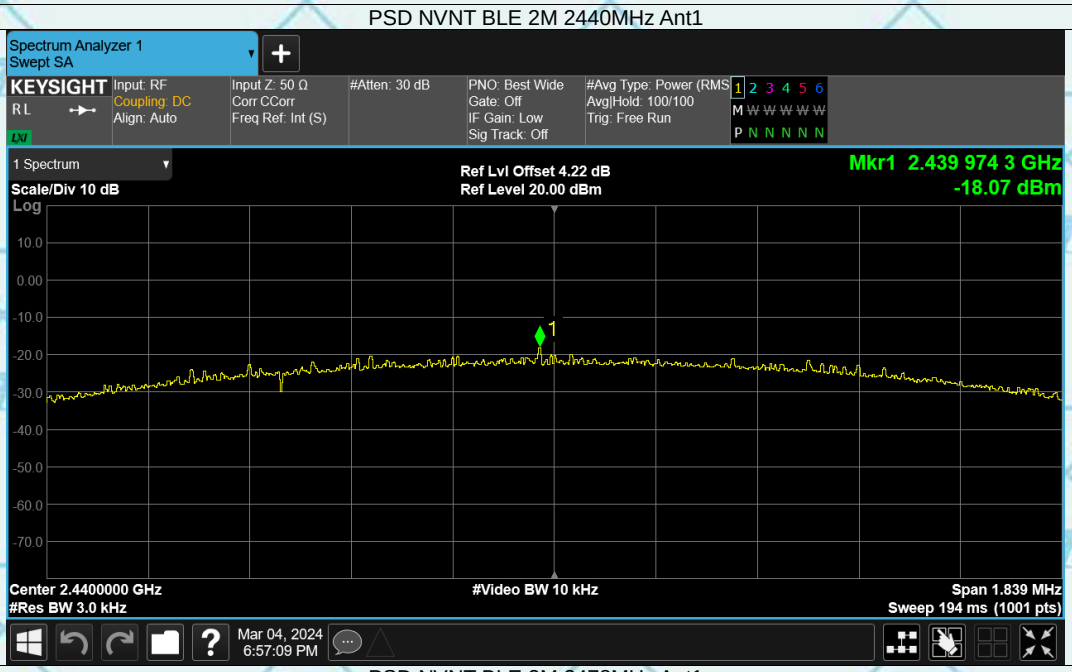
PSD NVNT BLE 1M 2480MHz Ant1



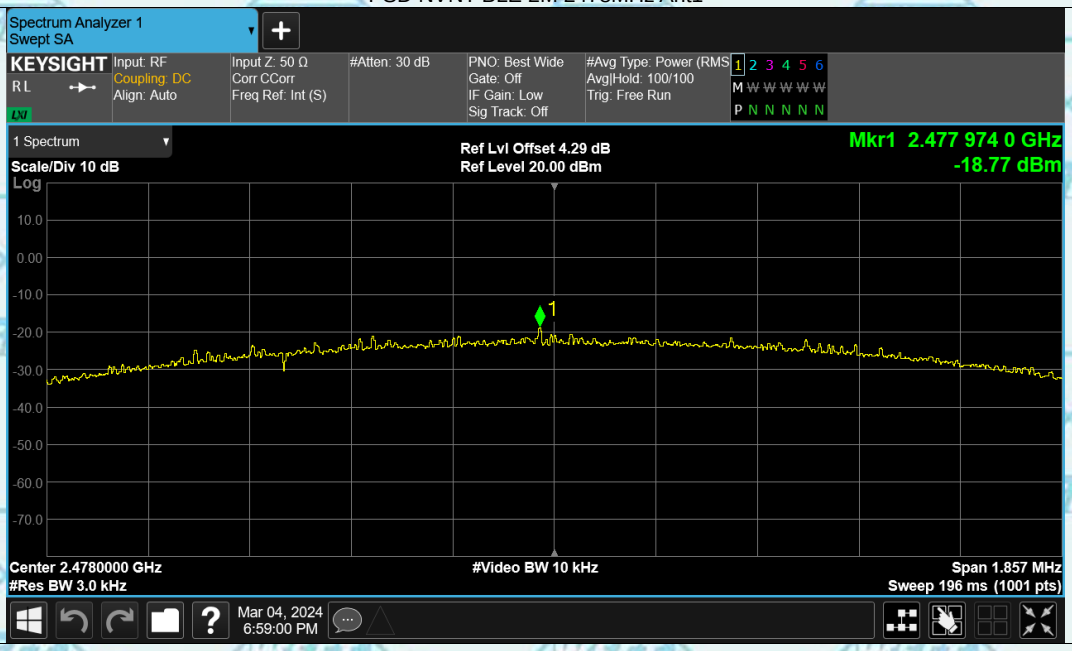

PSD NVNT BLE 2M 2404MHz Ant1



PSD NVNT BLE 2M 2440MHz Ant1

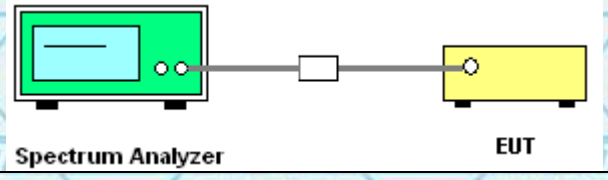



PSD NVNT BLE 2M 2478MHz Ant1



## 6.6. Conducted Band Edge and Spurious Emission Measurement

### 6.6.1. Test Specification

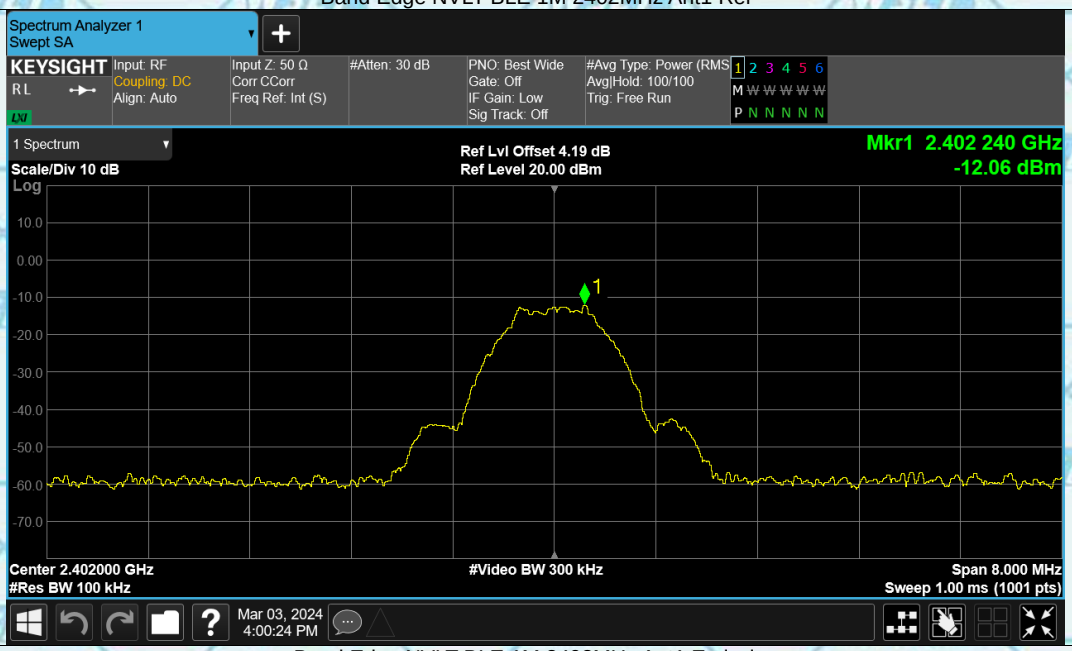
| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.247 (d) |
| **Test Method:** | KDB558074 |
| **Limit:** | In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). |
| **Test Setup:** |  |
| **Test Mode:** | Refer to item 4.1 |
| **Test Procedure:** | 1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.<br>2. Set to the maximum power setting and enable the EUT transmit continuously.<br>3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).<br>4. Measure and record the results in the test report.<br>5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band. |
| **Test Result:** | PASS |

## Test Data

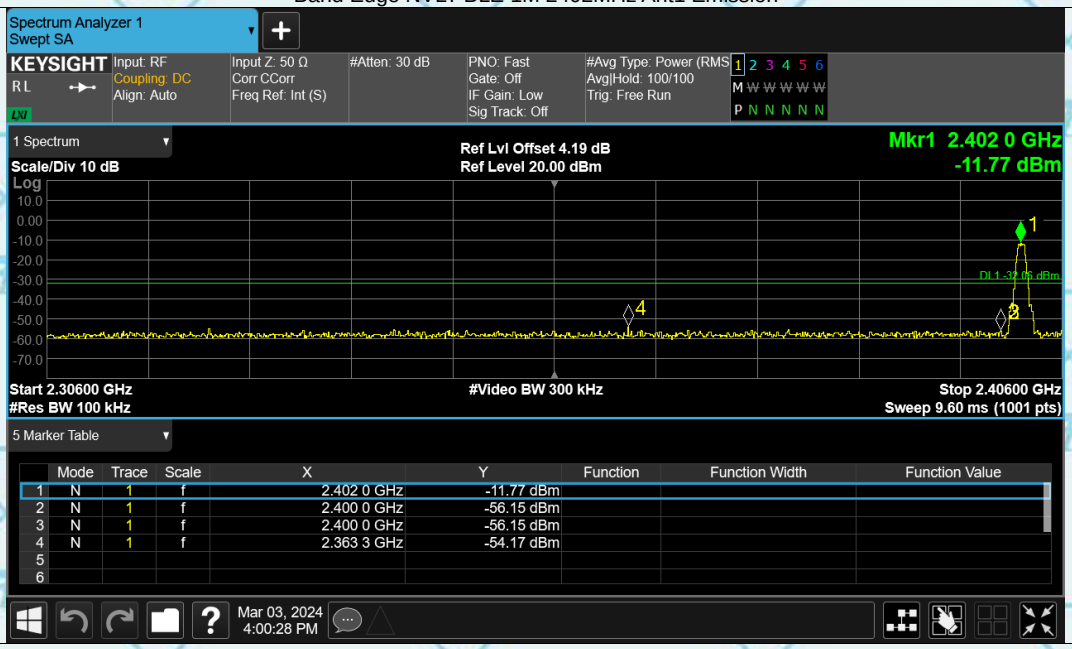
Band Edge

Test Graphs

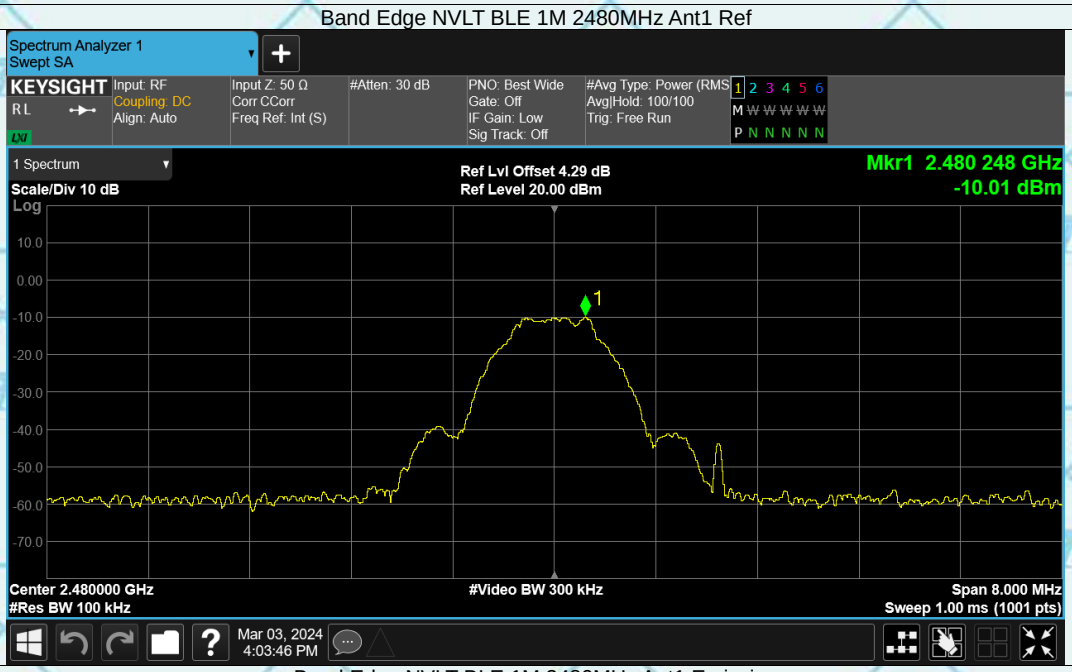
Band Edge NVLT BLE 1M 2402MHz Ant1 Ref



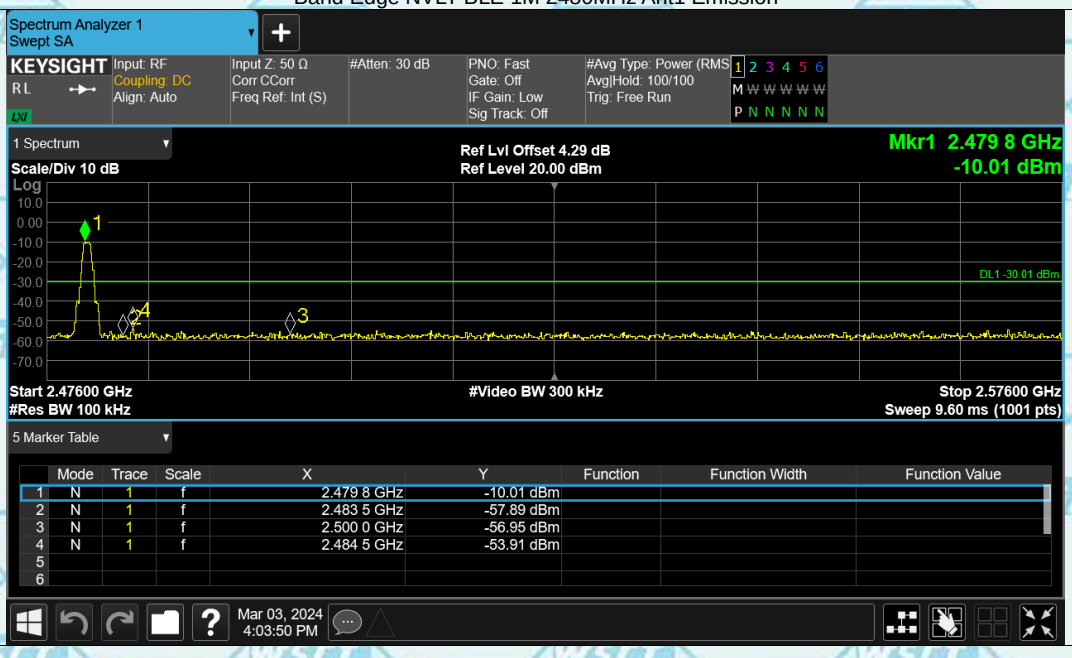

Band Edge NVLT BLE 1M 2402MHz Ant1 Emission



Band Edge NVLT BLE 1M 2480MHz Ant1 Ref

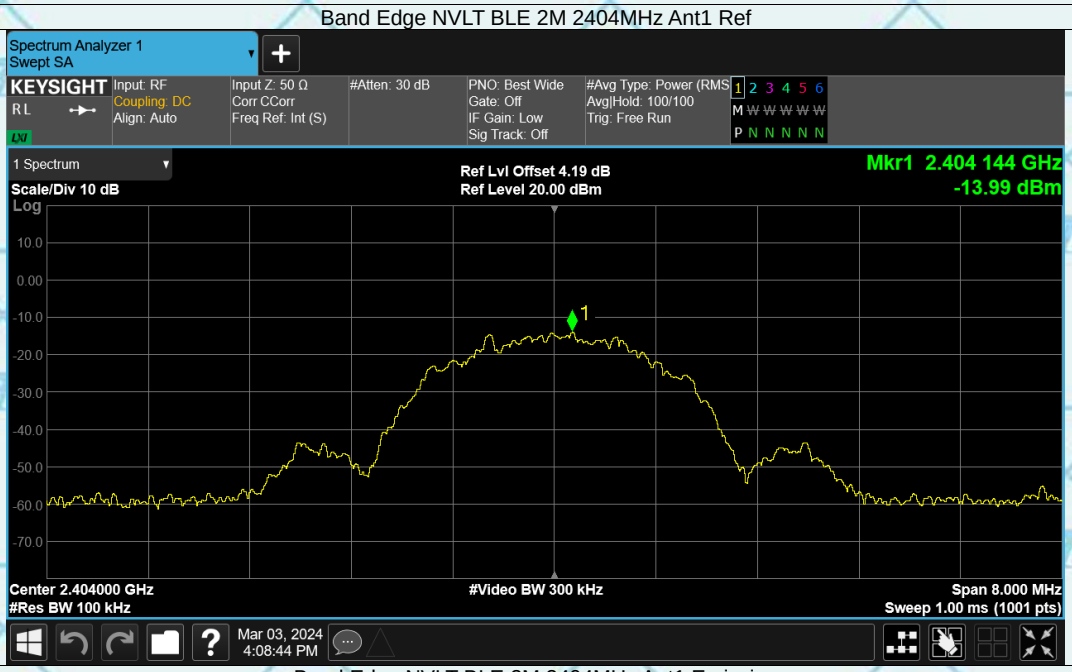



Band Edge NVLT BLE 1M 2480MHz Ant1 Emission

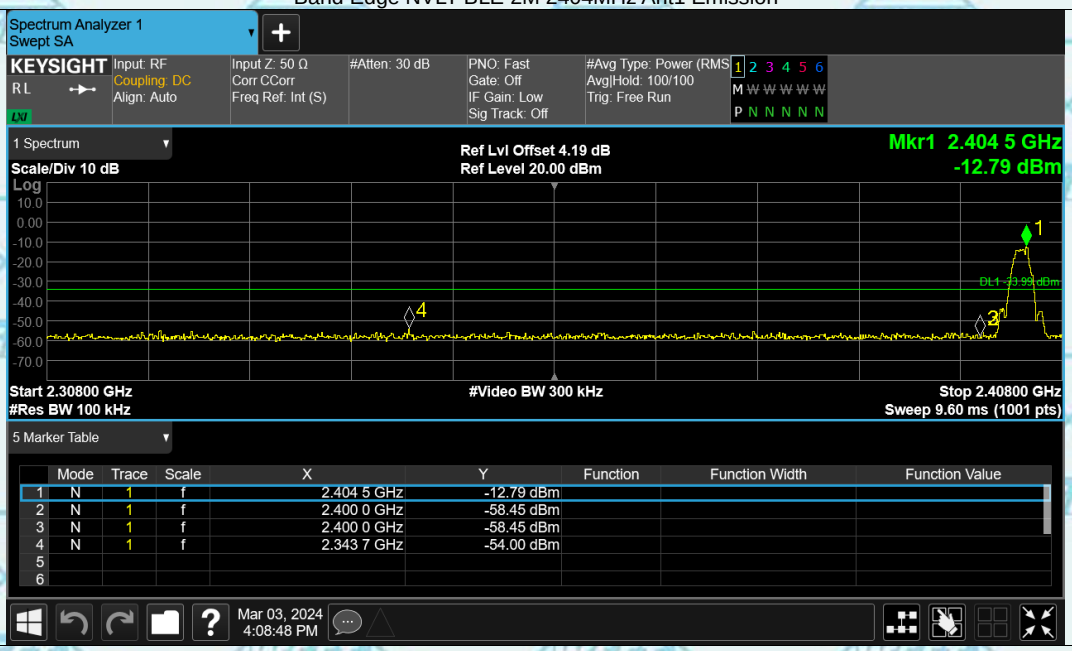



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.479 8 GHz | -10.01 dBm | | | |
| 2 | N | 1 | f | 2.483 5 GHz | -57.89 dBm | | | |
| 3 | N | 1 | f | 2.500 0 GHz | -56.95 dBm | | | |
| 4 | N | 1 | f | 2.484 5 GHz | -53.91 dBm | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

Band Edge NVLT BLE 2M 2404MHz Ant1 Ref

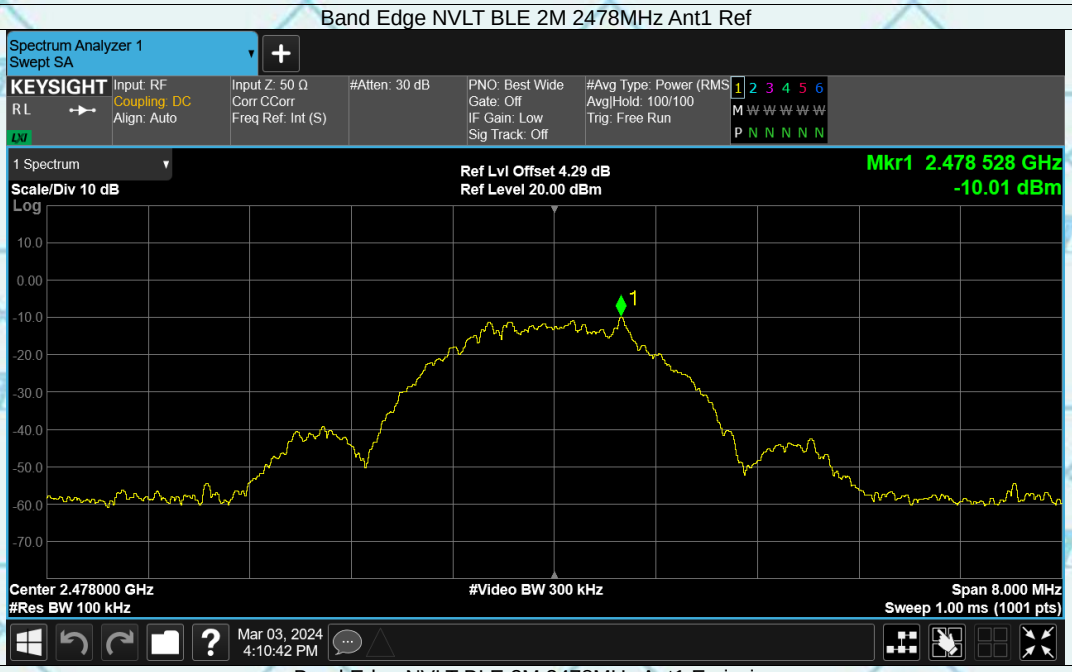



Band Edge NVLT BLE 2M 2404MHz Ant1 Emission

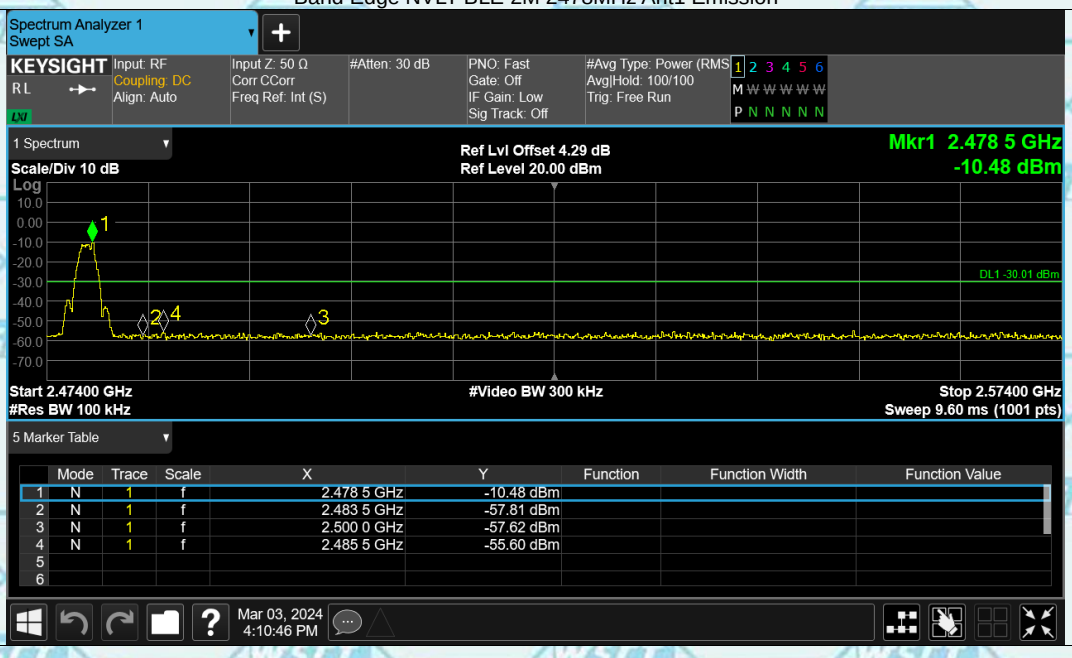



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.404 5 GHz | -12.79 dBm | | | |
| 2 | N | 1 | f | 2.400 0 GHz | -58.45 dBm | | | |
| 3 | N | 1 | f | 2.400 0 GHz | -58.45 dBm | | | |
| 4 | N | 1 | f | 2.343 7 GHz | -54.00 dBm | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

Band Edge NVLT BLE 2M 2478MHz Ant1 Ref




Band Edge NVLT BLE 2M 2478MHz Ant1 Emission

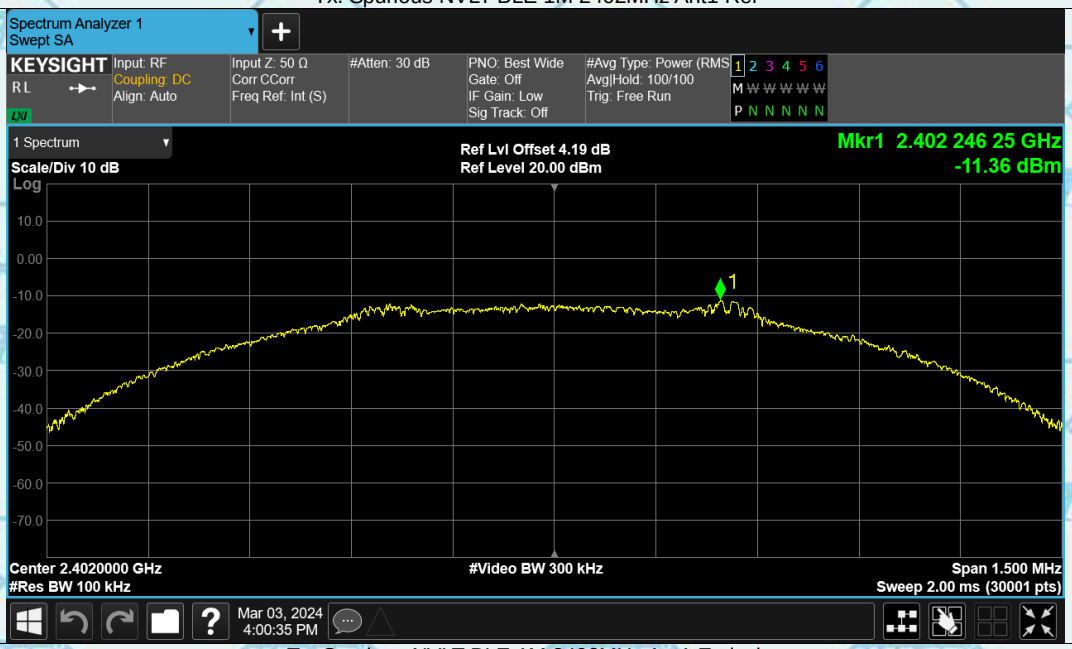



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.478 5 GHz | -10.48 dBm | | | |
| 2 | N | 1 | f | 2.483 5 GHz | -57.81 dBm | | | |
| 3 | N | 1 | f | 2.500 0 GHz | -57.62 dBm | | | |
| 4 | N | 1 | f | 2.485 5 GHz | -55.60 dBm | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |

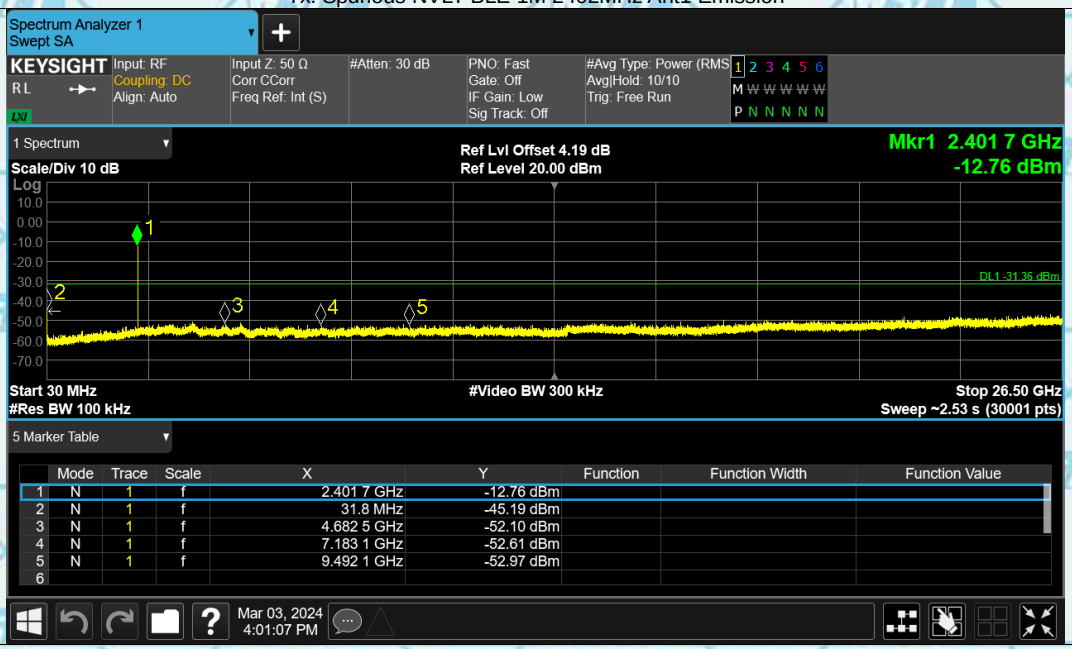
# Conducted RF Spurious Emission

Test Graphs

Tx. Spurious NVLT BLE 1M 2402MHz Ant1 Ref

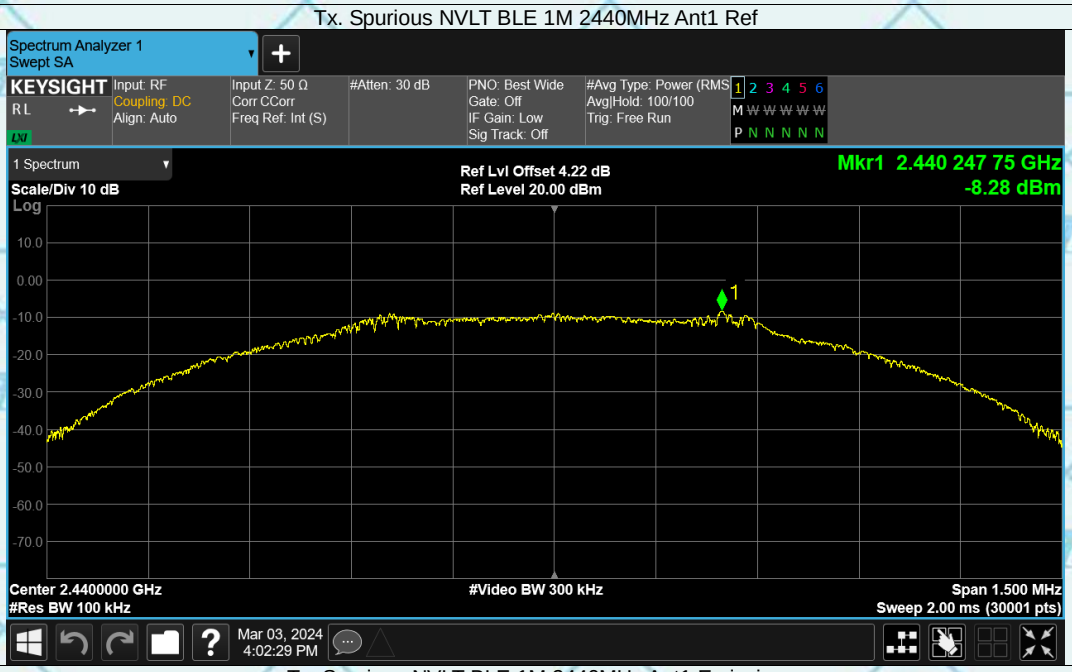



Tx. Spurious NVLT BLE 1M 2402MHz Ant1 Emission

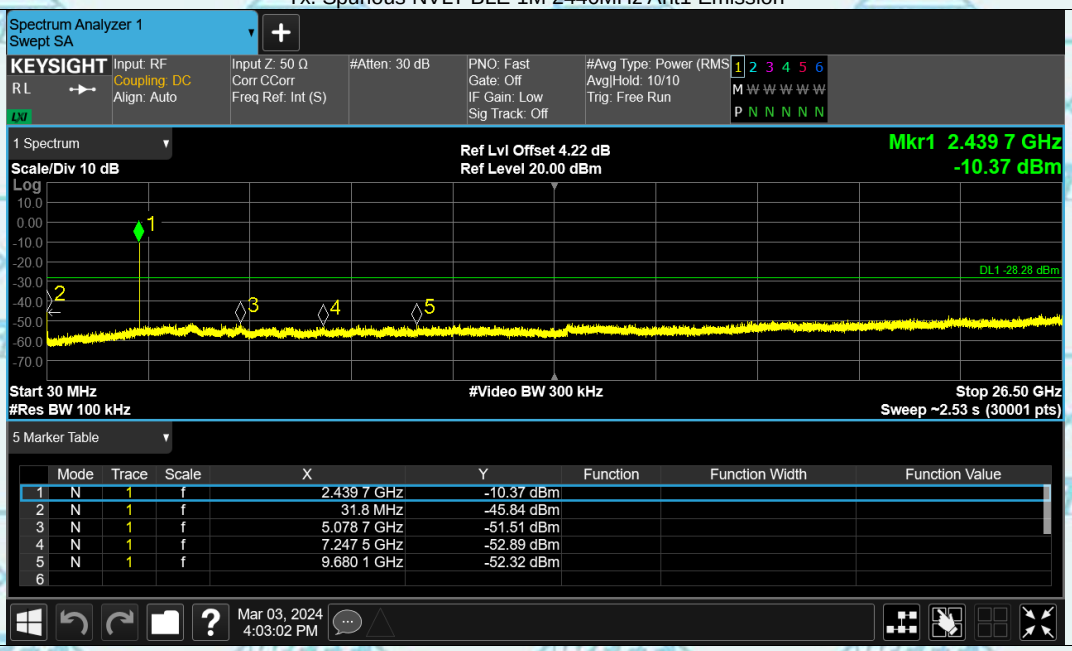



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.401 7 GHz | -12.76 dBm | | | |
| 2 | N | 1 | f | 31.8 MHz | -45.19 dBm | | | |
| 3 | N | 1 | f | 4.682 5 GHz | -52.10 dBm | | | |
| 4 | N | 1 | f | 7.183 1 GHz | -52.61 dBm | | | |
| 5 | N | 1 | f | 9.492 1 GHz | -52.97 dBm | | | |
| 6 | | | | | | | | |

Tx. Spurious NVLT BLE 1M 2440MHz Ant1 Ref

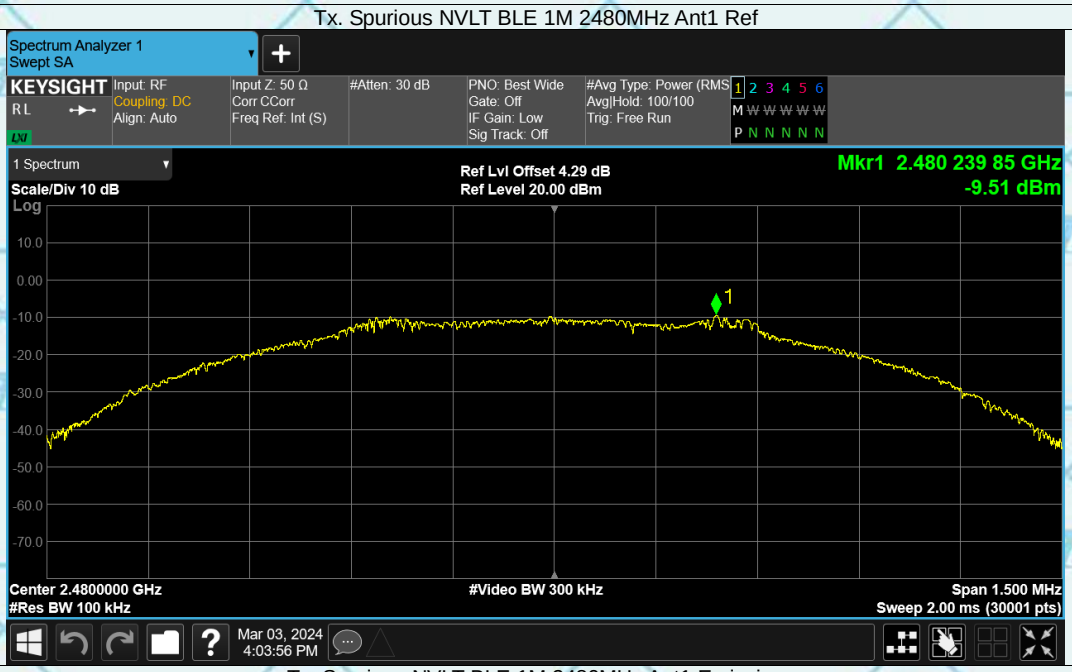



Tx. Spurious NVLT BLE 1M 2440MHz Ant1 Emission

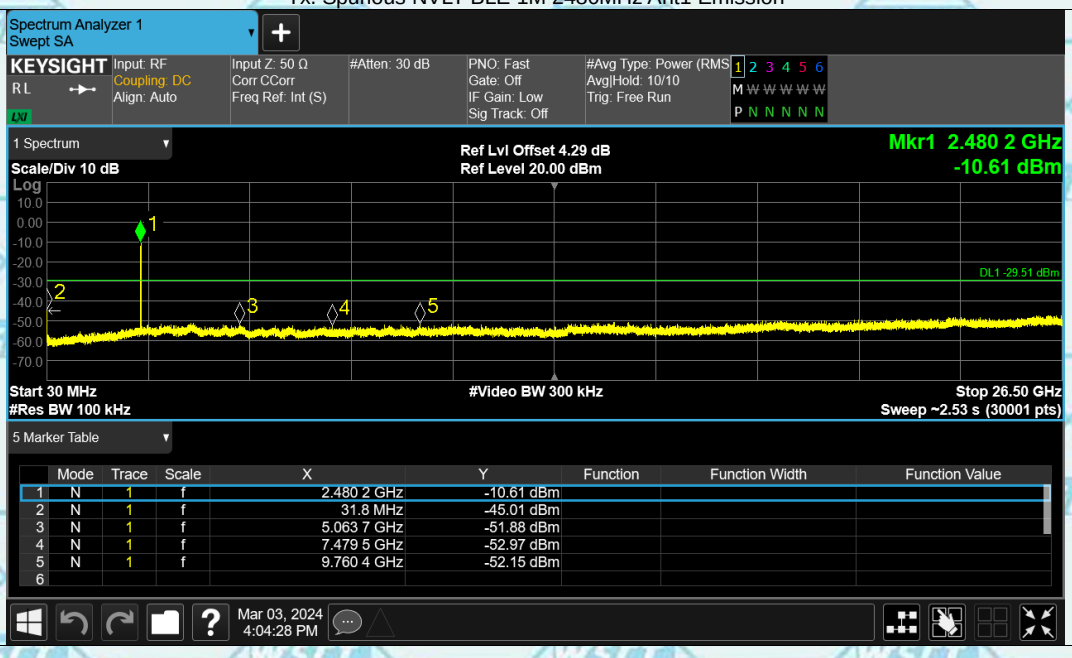



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.439 7 GHz | -10.37 dBm | | | |
| 2 | N | 1 | f | 31.8 MHz | -45.84 dBm | | | |
| 3 | N | 1 | f | 5.078 7 GHz | -51.51 dBm | | | |
| 4 | N | 1 | f | 7.247 5 GHz | -52.89 dBm | | | |
| 5 | N | 1 | f | 9.680 1 GHz | -52.32 dBm | | | |
| 6 | | | | | | | | |

Tx. Spurious NVLT BLE 1M 2480MHz Ant1 Ref

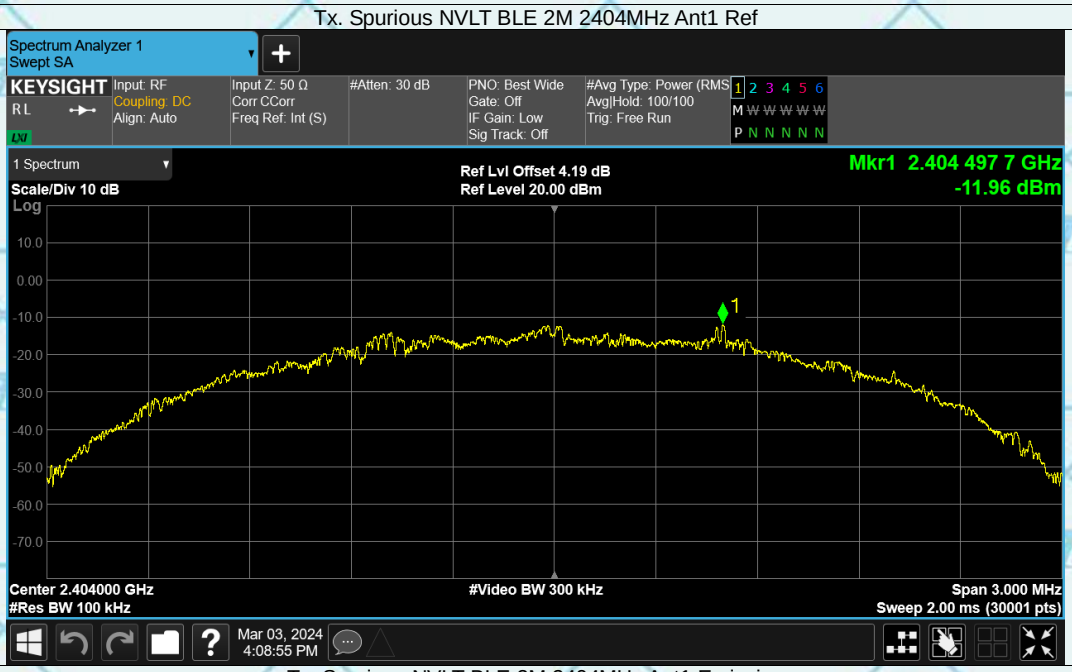



Tx. Spurious NVLT BLE 1M 2480MHz Ant1 Emission

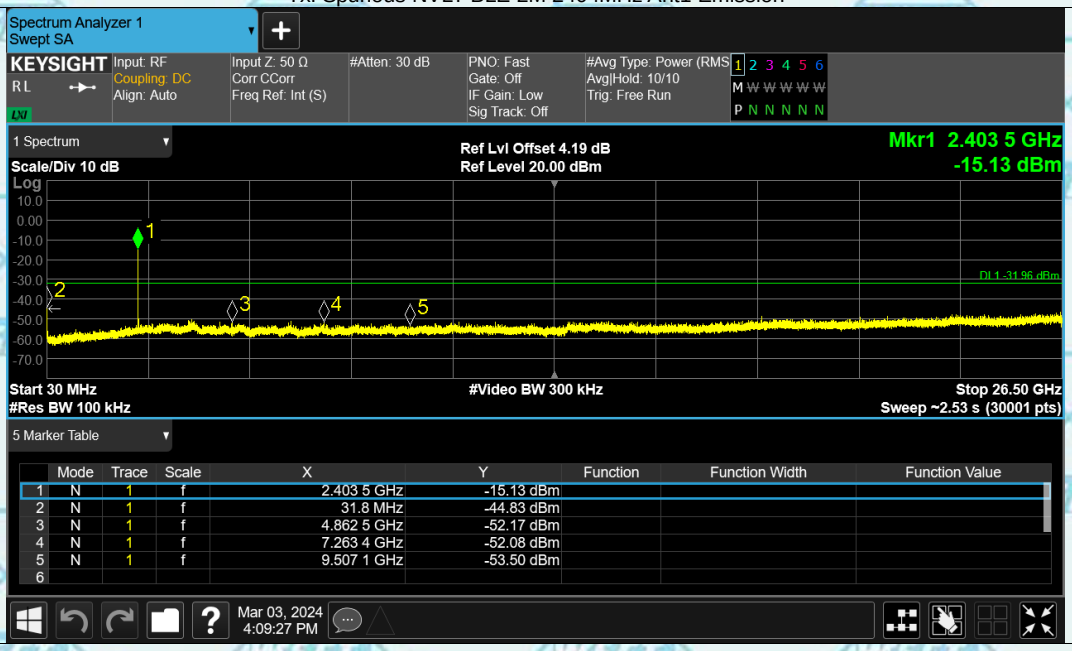



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.480 2 GHz | -10.61 dBm | | | |
| 2 | N | 1 | f | 31.8 MHz | -45.01 dBm | | | |
| 3 | N | 1 | f | 5.063 7 GHz | -51.88 dBm | | | |
| 4 | N | 1 | f | 7.479 5 GHz | -52.97 dBm | | | |
| 5 | N | 1 | f | 9.760 4 GHz | -52.15 dBm | | | |
| 6 | | | | | | | | |

Tx. Spurious NVLT BLE 2M 2404MHz Ant1 Ref

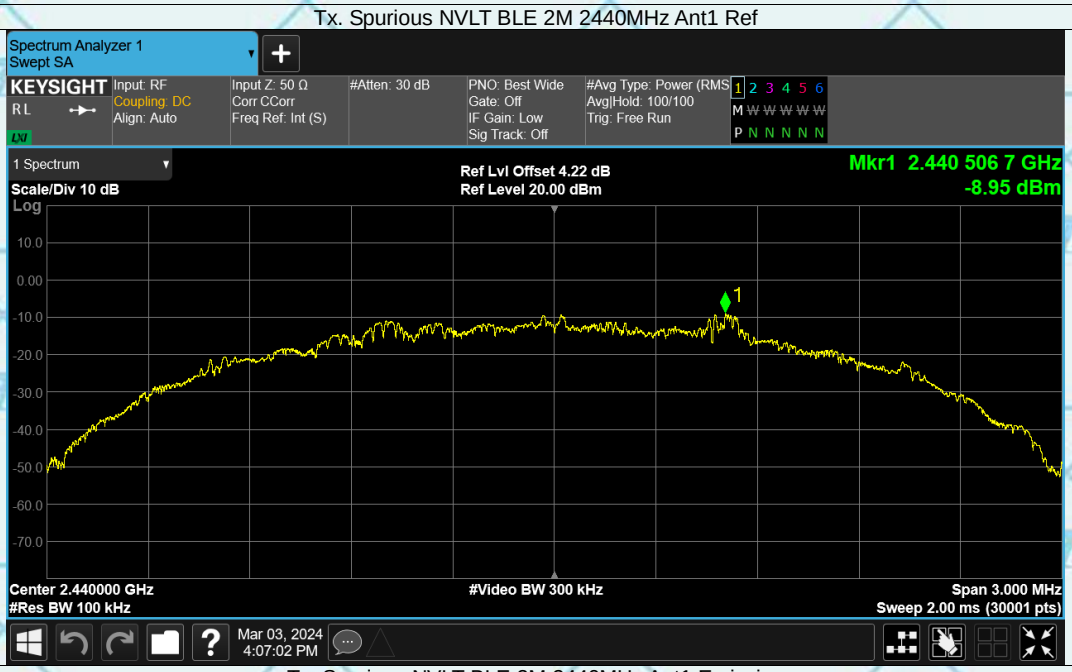



Tx. Spurious NVLT BLE 2M 2404MHz Ant1 Emission

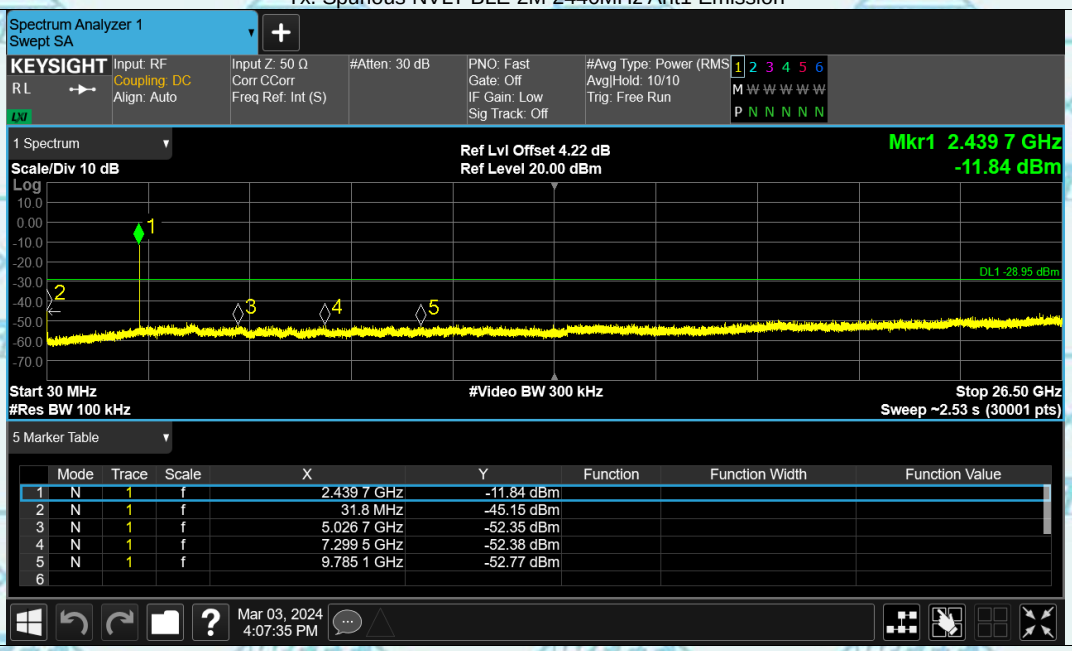



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.403 5 GHz | -15.13 dBm | | | |
| 2 | N | 1 | f | 31.8 MHz | -44.83 dBm | | | |
| 3 | N | 1 | f | 4.862 5 GHz | -52.17 dBm | | | |
| 4 | N | 1 | f | 7.263 4 GHz | -52.08 dBm | | | |
| 5 | N | 1 | f | 9.507 1 GHz | -53.50 dBm | | | |
| 6 | | | | | | | | |

Tx. Spurious NVLT BLE 2M 2440MHz Ant1 Ref

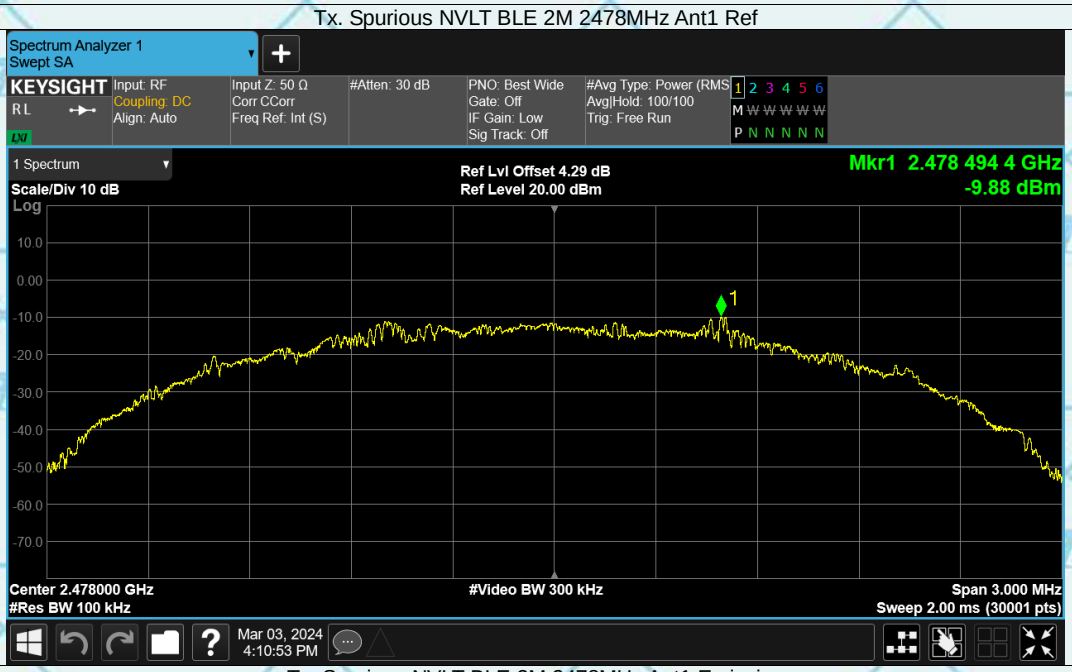



Tx. Spurious NVLT BLE 2M 2440MHz Ant1 Emission

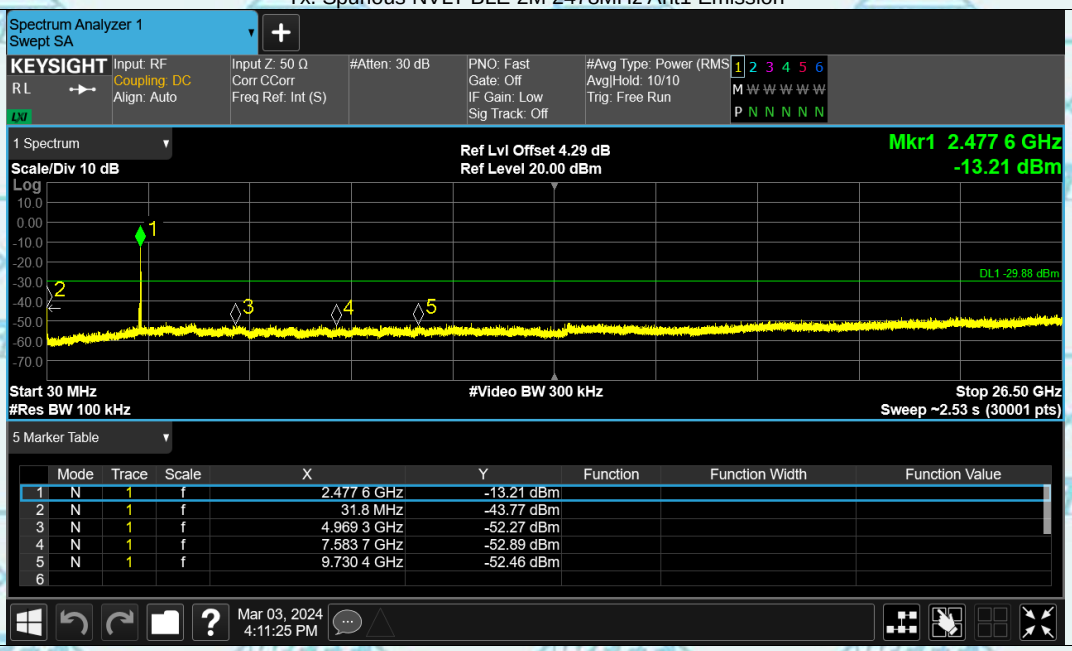



| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.439 7 GHz | -11.84 dBm | | | |
| 2 | N | 1 | f | 31.8 MHz | -45.15 dBm | | | |
| 3 | N | 1 | f | 5.026 7 GHz | -52.35 dBm | | | |
| 4 | N | 1 | f | 7.299 5 GHz | -52.38 dBm | | | |
| 5 | N | 1 | f | 9.785 1 GHz | -52.77 dBm | | | |
| 6 | | | | | | | | |

Tx. Spurious NVLT BLE 2M 2478MHz Ant1 Ref




Tx. Spurious NVLT BLE 2M 2478MHz Ant1 Emission




| | Mode | Trace | Scale | X | Y | Function | Function Width | Function Value |
|---|---|---|---|---|---|---|---|---|
| 1 | N | 1 | f | 2.477 6 GHz | -13.21 dBm | | | |
| 2 | N | 1 | f | 31.8 MHz | -43.77 dBm | | | |
| 3 | N | 1 | f | 4.969 3 GHz | -52.27 dBm | | | |
| 4 | N | 1 | f | 7.583 7 GHz | -52.89 dBm | | | |
| 5 | N | 1 | f | 9.730 4 GHz | -52.46 dBm | | | |
| 6 | | | | | | | | |

## 6.7. Radiated Spurious Emission Measurement

### 6.7.1. Test Specification

| | |
|---|---|
| **Test Requirement:** | FCC Part15 C Section 15.209 |
| **Test Method:** | ANSI C63.10:2014 |
| **Frequency Range:** | 9 kHz to 25 GHz |
| **Measurement Distance:** | 3 m |
| **Antenna Polarization:** | Horizontal & Vertical |
| **Operation mode:** | Refer to item 4.1 |

**Receiver Setup:**

| Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|
| 9kHz- 150kHz | Quasi-peak | 200Hz | 1kHz | Quasi-peak Value |
| 150kHz-30MHz | Quasi-peak | 9kHz | 30kHz | Quasi-peak Value |
| 30MHz-1GHz | Quasi-peak | 100KHz | 300KHz | Quasi-peak Value |
| Above 1GHz | Peak | 1MHz | 3MHz | Peak Value |
| | Peak | 1MHz | 10Hz | Average Value |

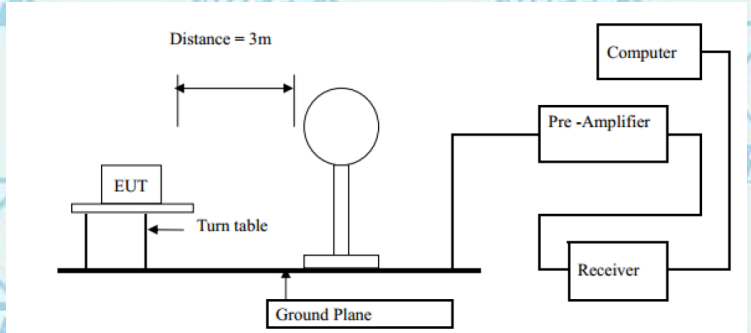
**Limit:**

| Frequency | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(KHz) | 300 |
| 0.490-1.705 | 24000/F(KHz) | 30 |
| 1.705-30 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

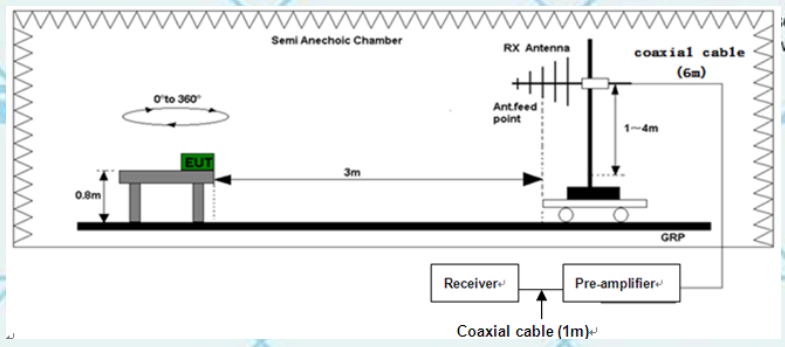
| Frequency | Field Strength (microvolts/meter) | Measurement Distance (meters) | Detector |
|---|---|---|---|
| Above 1GHz | 500 | 3 | Average |
| | 5000 | 3 | Peak |

**Test setup:**

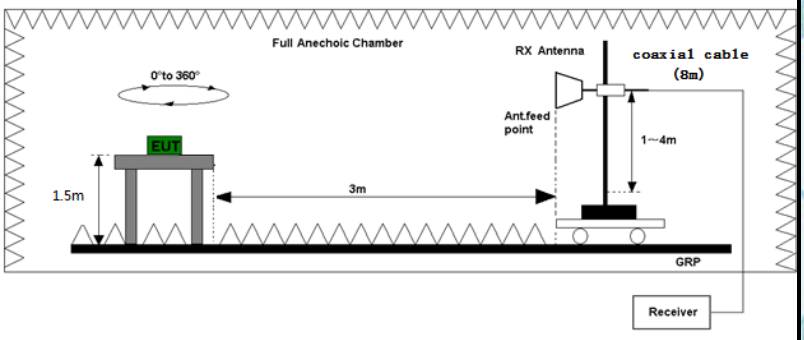
For radiated emissions below 30MHz




30MHz to 1GHz




Above 1GHz




**Test Procedure:**

1. For the radiated emission test below 1GHz:
The EUT was placed on a turntable with 0.1 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.
For the radiated emission test above 1GHz:
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
2. Corrected Reading: Antenna Factor + Cable Loss +

| | |
|---|---|
| | Read Level - Preamp Factor = Level<br>3. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.<br>4. Use the following spectrum analyzer settings:<br>(1) Span shall wide enough to fully capture the emission being measured;<br>(2) Set RBW=100 kHz for f < 1 GHz; VBW ≥RBW; Sweep = auto; Detector function = peak; Trace = max hold;<br>(3) Set RBW = 1 MHz, VBW= 3MHz for f 1 GHz for peak measurement.<br>For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. |
| **Test mode:** | Refer to section 4.1 for details |
| **Test results:** | PASS |

Note 1: The symbol of "--" in the table which means not application.

Note 2: For the test data above 1 GHz，According the ANSI C63.10-2013, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

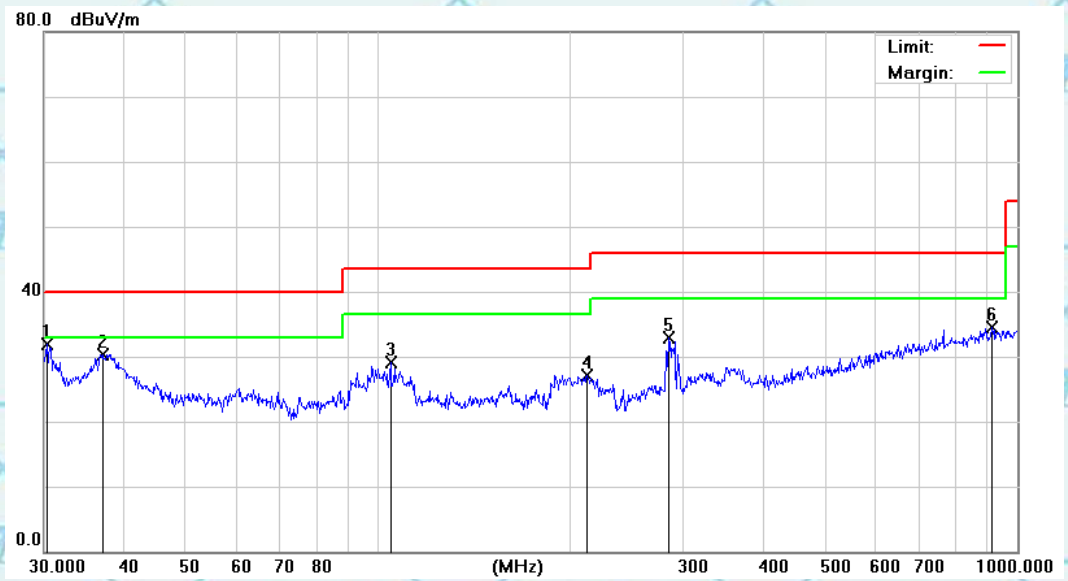
Note 4: The EUT is working in the Normal link mode below 1 GHz. All modes have been tested and normal link mode is worst.

### 6.7.2. Test Data

**Please refer to following diagram for individual**

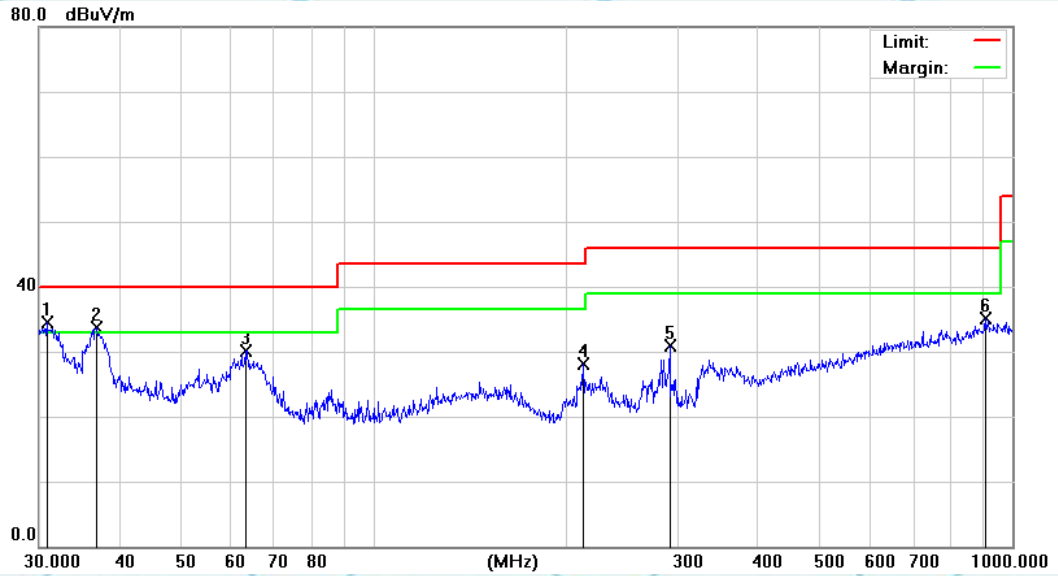
**Below 1GHz**

Horizontal:




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | * | 30.3173 | 35.09 | -3.20 | 31.89 | 40.00 | -8.11 | QP |
| 2 | | 37.0248 | 32.72 | -2.40 | 30.32 | 40.00 | -9.68 | QP |
| 3 | | 104.5361 | 34.64 | -5.45 | 29.19 | 43.50 | -14.31 | QP |
| 4 | | 212.2695 | 32.86 | -5.72 | 27.14 | 43.50 | -16.36 | QP |
| 5 | | 284.9767 | 36.05 | -3.20 | 32.85 | 46.00 | -13.15 | QP |
| 6 | | 912.8620 | 27.41 | 7.16 | 34.57 | 46.00 | -11.43 | QP |

Vertical:




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | * | 30.8535 | 37.63 | -3.20 | 34.43 | 40.00 | -5.57 | QP |
| 2 | ! | 36.8953 | 36.12 | -2.42 | 33.70 | 40.00 | -6.30 | QP |
| 3 | | 63.0916 | 33.97 | -3.83 | 30.14 | 40.00 | -9.86 | QP |
| 4 | | 213.0151 | 33.79 | -5.66 | 28.13 | 43.50 | -15.37 | QP |
| 5 | | 291.0360 | 33.96 | -2.98 | 30.98 | 46.00 | -15.02 | QP |
| 6 | | 906.4824 | 27.98 | 7.03 | 35.01 | 46.00 | -10.99 | QP |

Note1:
Freq. = Emission frequency in MHz
Reading level (dBµV) = Receiver reading
Corr. Factor (dB) = Antenna factor + Cable loss - Amplifier factor.
Measurement (dBµV) = Reading level (dBµV) + Corr. Factor (dB)
Limit (dBµV) = Limit stated in standard
Margin (dB) = Measurement (dBµV) – Limits (dBµV)

## Above 1GHz

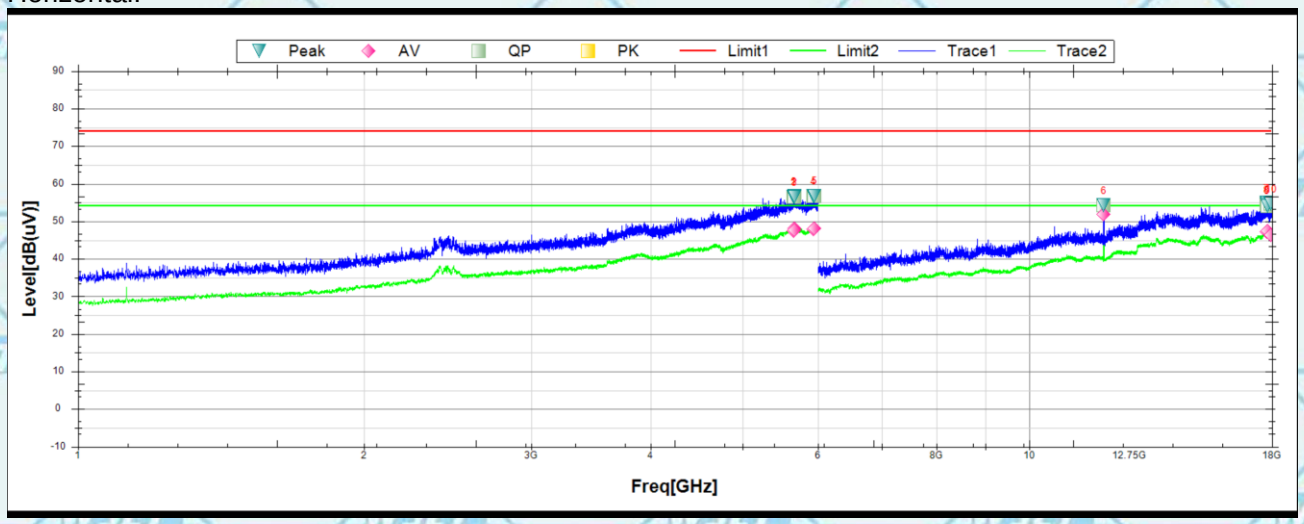
Note 1: The marked spikes near 2400 MHz with circle should be ignored because they are Fundamental signal.

Note 2: The spurious above 18G is noise only, do not show on the report.

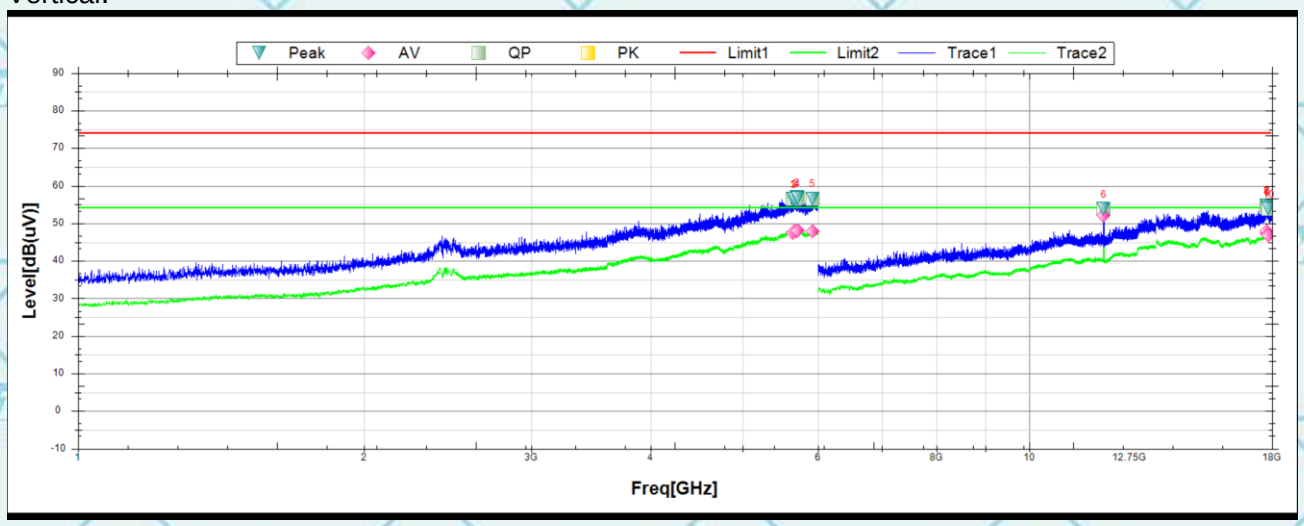
Note 3 BLE 1M and 2M both tested the report and only recorded the worst-case scenario 1M:

Low channel: 2402MHz

Horizontal:

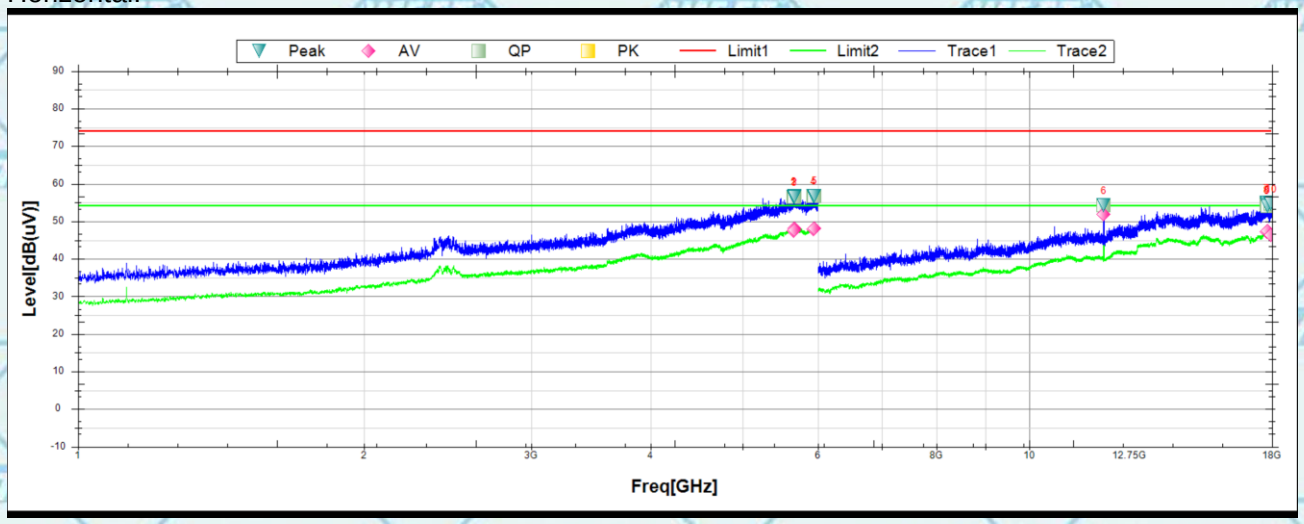



Vertical:

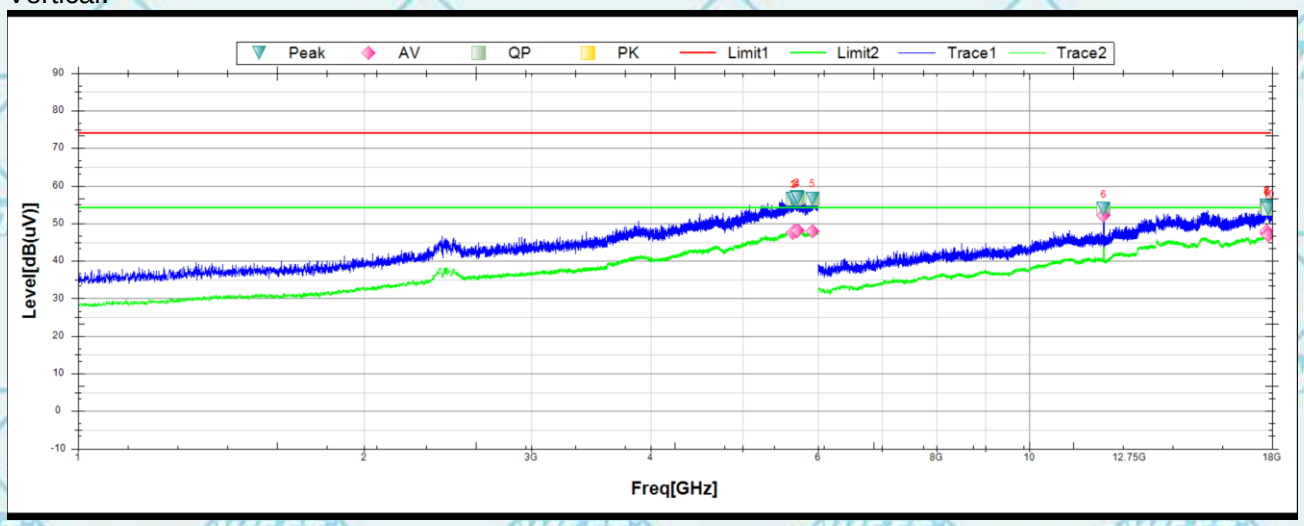


Middle channel: 2440MHz

Horizontal:

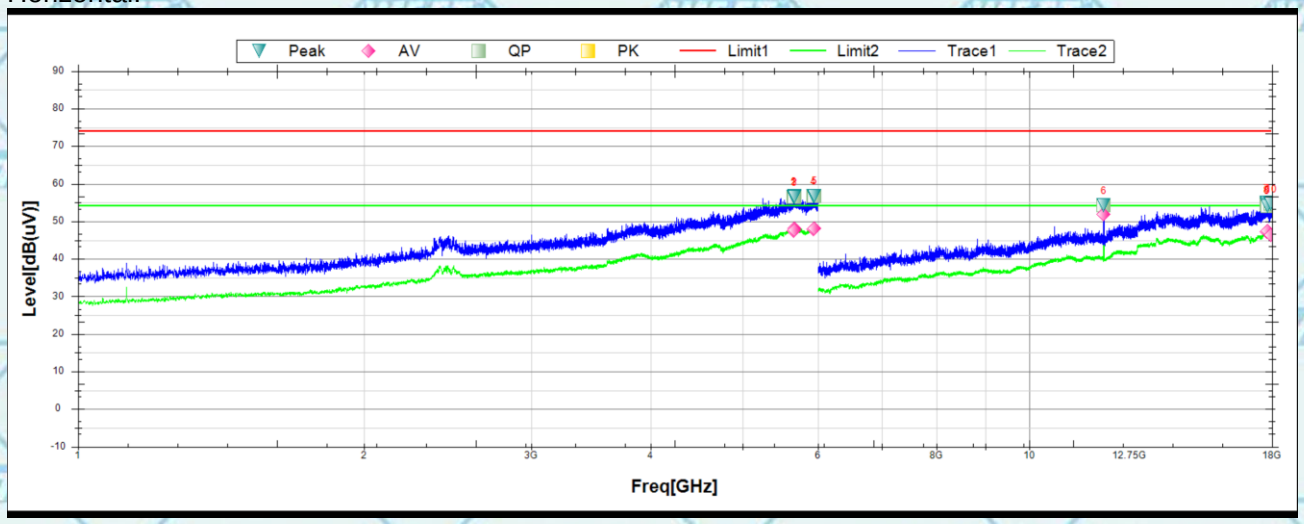



Vertical:

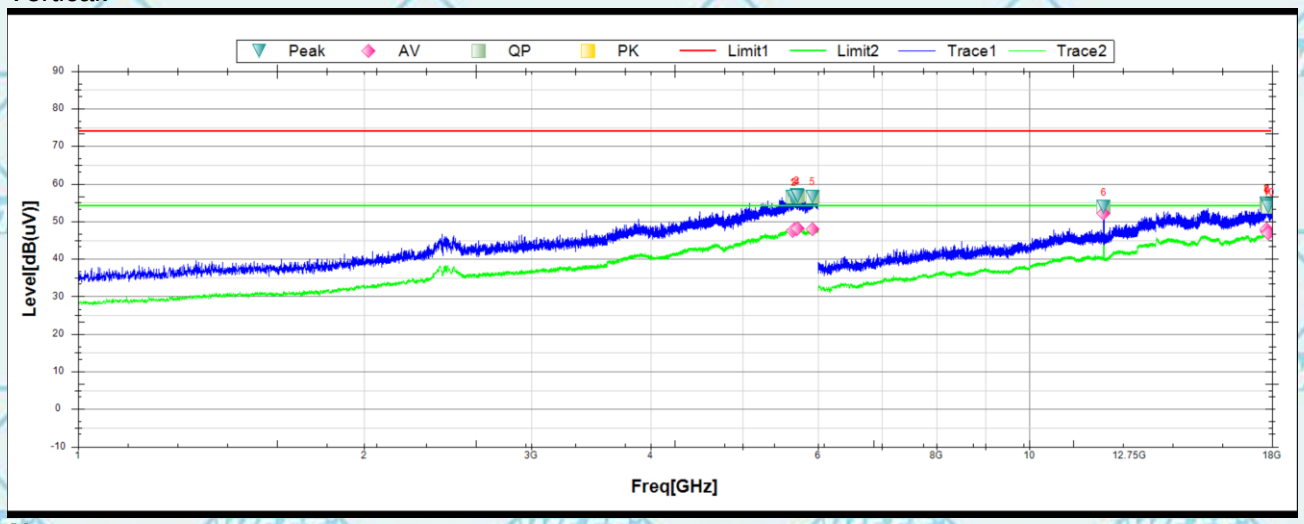


High channel: 2480MHz

Horizontal:




Vertical:




***Note:***

1. *All emissions not reported were more than 20dB below the specified limit or in the noise floor.*
2. *Emission Level= Reading Level+Probe Factor +Cable Loss.*
3. *Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
4. *EUT has been tested in unfolded states, and the report only reflects data in the unfolded state (worst-case scenario)*

## 7. Test Setup Photographs

Please refer to Annex "Set Up Photos-15C" for test setup photos

*******END OF REPORT*******